DURHAM

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CITY OF MEDICINE

City of Durham Public Works "Reference Guide for Development" Provided by the: Engineering Division Transportation Division Stormwater Services Division

City of Durham Public Works Department

Mailing Address: ***101 City Hall Plaza***

Durham, North Carolina 27701

Location: ***3rd Floor of City Hall***

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Facsimile: ***(919) 560-4316***

City of Durham Homepage: ***www.ci.durham.nc.us***

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DIRECTORY

These are the most commonly referred to numbers that are involved in development plans.

Durham City	**Telephone (919)**	**Fax (919)**
Home Page (www.ci.durham.nc.us)		
Public Works Department		
Engineering Division (includes):	560-4326	560-4316
Development Review		
Inspection Section (water/sewer/storm sewer/City ROW)		
Services (water/sanitary sewer taps, water meters, connection charges)		
Stormwater Services Division	560-4326	560-4316
Transportation Division	560-4366	560-4561
Water and Sanitary Sewer Maintenance	560-4344	560-4340
Street Maintenance	560-4312	560-4340
Roadway Appearance/Urban Forestry	560-4105	560-4021
Parks and Recreation	560-4355	560-4021
Solid Waste (dumpster locations)	560-4185 x-231	560-4647
Budget Management (annexation petitions)	560-4111	560-4687
Environmental Resources		
Cross Connection (backflow devices)	560-4194	560-4479
Industrial Waste	560-4381	560-4479
Solid Waste	560-4611	560-4392
Joint City/County offices of Durham		
Home Page (www.ci.durham.nc.us)		
Building Inspection Department (building permit)	560-4144	560-4484
Fire Protection	560-1199	560-4484
Planning Department	560-4137	560-4641
Solid Waste	560-4185	560-4647
Durham County		
Utility Division (sanitary sewer)	560-7993	560-7950
Erosion Control (grading permit)	560-0735	560-0740
Fire Marshal	560-0660	560-0670
Health Department (well/septic permits)	560-7800	560-7830
North Carolina Department of Transportation (NCDOT)		
Driveway/Road Widening Permit	560-6854	560-3371
Encroachments	560-6854	560-3371
North Carolina Department of Environment and Natural Resources (NCDENR)		
State Permitting Office (water/sewer/stormwater basins)	733-5083	733-9919
Raleigh Regional Office (dams/stormwater basins)	571-4700	571-4718
NC Wetlands Restoration Program	733-5208	733-5321
U.S. Army Corps of Engineers (wetland delineation) Regional Office	876-8441	
Wilmington Office - (Real-estate)	1-800-848-8091	
Some of the Utility Companies		
Carolina Power and Light (CP & L)	1-800-452-2777	
Duke Power	1-800-653-5307	
Piedmont Electric	1-800-222-3107	
Time/Warner of Durham	220-4481	

Public Service Gas	1-877-776-2427
NC One Call (Utility Locating Company)	1-800-632-4949
Verizon (residential)	1-800-483-4300

INTRODUCTION

We are pleased to distribute to design professionals this Reference Guide for Development. The City of Durham Public Works Department, Engineering, Transportation and Stormwater Services Divisions, prepared this guide to provide a reference manual to some of the City of Durham Public Works Department's design standards and design requirements and to reference other key Departments involved in the Development Review Process. This guide does not cover all aspects of plan review and requirements. We are referencing the most frequently asked questions and procedures. The policies, requirements, specifications and charges listed herein are subject to change as amended.

It should be noted that projects may be required to meet additional criteria as set by the Durham City Council or the City of Durham Public Works Department. The City of Durham reserves the right to require any additional measures in accordance with City Codes, ordinances, policies and to address public safety concerns during any stage of the project.

There are detailed construction specifications for water, sanitary sewer, street and stormwater construction that are available from the Engineering Division of the Public Works Department.

If you have questions regarding the City of Durham Engineering's or Stormwater Services' procedures or policies not addressed in this guide, please contact the Divisions (919-560-4326). If you have questions regarding the City of Durham Transportation's procedures or policies not addressed in this guide, please contact the Division (919-560-4366).

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PREFACE TO OCTOBER, 2003 UPDATE TO THE REFERENCE GUIDE FOR DEVELOPMENT

As an ongoing effort to provide better customer service to all parties involved with land development in Durham, the Public Works Department has undertaken the task of updating and revising this manual. Much of the initial printing remains the same but numerous issues, including those highlighted below, have been revisited and revised.

Summarized below are the major changes and additions to this guide. This summary is provided to give a "thumbnail sketch" of the revisions. We have elected not to highlight changes throughout the manual. This February 2003 update is a replacement of the October 2000 and July 1998 printing.

Section	Revision Description
1.0-1.3	New section developed for referencing Engineering, Transportation and Stormwater Services requirements for rezoning, site plans and final plats.
2.0-2.5	New and revised sections to better describe the construction drawing approval process, construction process and submittal requirements.
3.0	Revised permitting requirements and explanations per State, explanation of permitting time lines, Building service permitting requirements (NCDENR link: http://h2o.enr.state.nc.us/ndpu/ndpupol.html#Permit)
4.0-4.4	New and revised sections to better describe the stormwater Best Management Practice as-built requirements.
5.0	Revised section to better describe fire flow analysis and report element requirements, additional testing requirements during construction, additional profile requirements along existing roads, easement restrictions and revised valve locations.
7.0	Revised permitting requirements per State regulation requirements, location and easement requirements, additional building setbacks, rim elevations, food service dumpster requirements and force main lining requirements.
8.0-8.4	New and revised stormwater requirements for pipe systems, conveyances, easements and BMPs. Requirements of Neuse River Basin.
9.0	Minor changes to street design criteria, addition of temporary turnaround requirements and details.
10.0	New section with all new requirements for signage requirements, TIAs and other Transportation requirements.
12.0	Revised standard notes sections with additional notes for typical situations. Added notes from previous sections (notes are standards for site plans and construction drawings).
13.0	Standardized forms
14.0	New fee schedule
15.0	Removed section.

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SECTION 1.0

PUBLIC WORKS DEPARTMENT ENGINEERING, STORMWATER SERVICES AND TRANSPORTATION DIVISIONS AND THE REZONING, SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT PROCESS

The following information is to provide a basic overview of the roles of the above divisions as they relate to the site plan and plat review process. However it should clearly understood that all correspondence, plan submittals and status inquires associated with these processes **must always** be directed to the Durham City /County Planning Department. All documents that are not received through the Durham City/County Planning Department will not be considered as a valid submittal and will not be reviewed accordingly by any Division.

ENGINEERING:

The City of Durham Engineering Division is located on the 3rd floor of City Hall. The Development Review Group is the main contact in the Engineering Division for all Engineering comments that are returned on rezoning, site plans and final plats. The Development Review Group can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Development Review Group, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Engineering Division is tasked with reviewing rezoning, site plans and preliminary plats as these items relate to the City of Durham public and private road standards, sidewalk, water system, fire protection systems, sanitary sewer system and stormwater drainage and conveyance systems. The City of Durham Engineering Division is also tasked with reviewing final plats as they relate to roadway rights-of-way, water systems, storm drainage conveyance systems, sanitary sewer systems and related easements.

The typical time line for review of rezoning, site plan and plats is determined by the Planning Department. The typical time line for review of all resubmittals is determined by the Planning Department.

TRANSPORTATION:

The City of Durham Transportation Division is located on the 4th floor of City Hall. The Transportation Division is the contact in the Public Works Department for Transportation comments that are returned on rezoning, site plans, and final plats. The Transportation Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 4th Floor, Transportation Division, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4366 and fax number is (919) 560-4561.

The City of Durham Transportation Division is tasked with reviewing rezoning, site plans and preliminary plats as these items relate to proposed public rights-of-way, cross-sections on proposed/existing roads, preserving the most current Durham Area Thoroughfare Plan (possible right-of way dedication and/or upgrade of the existing infrastructure), preserving the Bicycle Area Plan, placement of sidewalk, sight distance triangles, vehicular and pedestrian accesses, site traffic analyses (if necessary), interconnectivity of developments, and points of access. The City of Durham Transportation Division is tasked with reviewing final plats as they relate to proper public rights-of-way or private accesses (easements) and conforming to street naming convention for signage.

The typical time line for review of rezoning, site plan and plats is determined by the Planning Department. The typical time line for review of all resubmittals is determined by the Planning Department.

STORMWATER SERVICES:

The City of Durham Stormwater Services Division is located on the 3rd floor of City Hall. The Stormwater Services Division is the contact in the Public Works Department for all stormwater analysis comments that are returned on rezoning, site plans and final plats. The Stormwater Services Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Stormwater Services Division, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Stormwater Services Division is tasked with reviewing rezoning, site plans and preliminary plats as these items relate to stormwater impact studies, stream buffers (along with City/County Planning Department), floodplain analysis, stormwater quality systems and stormwater quantity facilities, as well as major stream crossing systems (culverts, spanning systems, etc.). The City of Durham Stormwater Services Division is also tasked with reviewing plats as they relate to floodplain issues, stream buffers (along with City/County Planning Department) and stormwater easements for water quality and quantity systems.

The typical time line for review of rezoning, site plan and plats is determined by the Planning Department. The typical time line for review of all resubmittals is determined by the Planning Department.

SECTION 1.1

ENGINEERING DIVISION, SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT SUBMITTAL REQUIREMENTS

The following section provides a list, which should be used by the applicant before any site plan, preliminary plat or final plat submittals so that the applicants are aware of the minimum requirements in order to receive a complete review. The checklists in this section are intended as a guide and are not a submittal requirement with plans.

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City of Durham

Public Works Department

Engineering Division

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Engineering Site Plan and Preliminary Plat Submittal Checklist

The following is a list of standard site plan and preliminary plat requirements that are reviewed by the City of Durham Engineering Division at the Site Plan and Preliminary Plat Stage of Development Review. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required. Site Plan and Preliminary Plat submittals without the following minimum criteria will be returned to the applicant without a complete review being performed thus resulting in additional delays to the site plan and preliminary plat process until the information is provided.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Company Name: _____

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met.

A. General Requirements (Cover Sheet)

Applicant's initials (typical all sections)

_____ a. Show all of the following items on the Cover sheet: date (original and all revisions), north arrow with reference, project name, vicinity map, PIN, and Tax Map Number.

_____ b. Provide an index map with match lines for multiple sheets for all plans as needed.

_____ c. Provide the name, address, telephone number, facsimile number, and email address if applicable of all professionals with a seal, signature and date.

B. Existing Site Conditions (Existing Conditions)

_____ a. Provide a north arrow with reference and an engineering/graphic scale (1"=200'max).

_____ b. Show all property boundaries with linear bearings and distances, curve boundary information (table format – curve number, radii, length, delta angle, chord bearing, and chord distance) and the building setbacks. State the source of the provided boundary information.

_____ c. Show all existing property lines, which are to be removed and label them as "Hereby removed".

_____ d. Show all adjacent parcels with the graphical angle of departure of adjacent property lines.

_____ e. Show all buildings and structures and label current use/facility name and finished floor elevation.

_____ f. Show all pavement, parking, and driveway access points on the property.

_____ g. Show all walkways/sidewalks/handicap ramps both adjacent to the development and opposite any existing roadways or intersections.

_____ h. Show all adjoining/opposing streets and alleys with names, rights-of-way and pavement widths, state route numbers, labeled as "Existing" and "Public" or "Private". Note any streets, alleys or rights-of-way that are unopened. All existing features and improvements (driveways, sidewalk, hydrants, light poles, etc.) must be shown that exist between the right-of-way lines.

_____ i. Show all water lines, sanitary sewer lines, services, cleanouts, valves, hydrants within 500 feet, water meters and vaults, backflow preventers, storm sewer systems, catch basins, headwalls, junction boxes, other structures, ditches and swales. Label all sizes, widths, inverts and type of material (if known) information for all items.

_____ j. For existing services or mains provide abandonment notes for water and sanitary sewer services which are being abandoned.

_____ k. Show and label all easements, both public and private with location and width. Define all easements by centerline bearings, distances and ties to property corners or page book and deed reference.

_____ l. Show all topography with a maximum of two-foot contour intervals for the development. Provide notes that indicate references to any permanent benchmarks, accepted datum, and source data. Durham topography maps may be used but it is recommended to obtain field topography.

C. Proposed Development (site plan or preliminary plat sheet)

_____ a. Clearly distinguish graphically between existing features and proposed features.

_____ b. Show all proposed property lines.

_____ c. Show all areas to be dedicated or reserved for public or private use and define with property lines or easements.

_____ d. Show all building setback lines.

_____ e. Clearly define the footprints of proposed buildings.

_____ f. Define with details typical roadway cross-sections for all proposed public or private streets/alleys. Details should include typical pavement structure, size of curbing, shoulders, sidewalks, pavement widths, and right-of-way widths as applicable.

_____ g. Clearly show on the proposed site plan all pavement and right-of-way widths to correspond to details and label right of ways as 'Public' or 'Private'.

_____ h. Provide new street centerline radius to show that streets will meet City of Durham standards.

_____ i. At the end of all street stubs to adjacent properties provide a temporary turnaround as instructed by City of Durham Engineering Division.

_____ j. Clearly indicate new parking areas, proposed driveways with radii and width, and valley gutters.

_____ k. If a townhome development is proposed and the streets are designed with parking on both sides provide the standard townhome note per the Reference Guide for Development. The pavement designs however must meet the City of Durham minimum road sections for residential streets.

_____ l. If required to install sidewalk along the frontage of the property by the City of Durham Transportation Division, all sidewalk shall be shown at the back of right of way. Handicap ramps shall be provided at all driveways and intersections and shall match existing handicap ramps and crosswalks for access. Note any request for payment-in-lieu of sidewalk construction must be reviewed by the City of Durham Engineering and Transportation Division prior to approval by DRB (all requests for payment-in-lieu should be submitted in writing with the site plan submittal

for review). If approved by DRB the applicant is required to state in the special conditions box of approvals the following statement: "The applicant has requested approval from DRB to make a payment-in-lieu for the sidewalk along some or the entire frontage of this project. This was approved by DRB on (provide date of approval). The applicant agrees to make the payment-in-lieu of sidewalk (amount of payment and length of sidewalk to be determined by the Public Works Department) when the applicant pays the City of Durham Engineering Division Inspection fees. If no inspection fees are required the applicant agrees to make the payment-in-lieu of sidewalk before the 1st certificate of occupancy will be issued."

_____ m. Show all internal sidewalks and provide handicap ramps per City of Durham standards. All internal sidewalks shall connect to sidewalks in the public right-of-way.

_____ n. Provide typical detail and a note in special conditions box stating driveway lengths shall be no less than 20' measured from right-of-way line or street easement line as applicable for residential projects.

D. Proposed Development (grading plan sheet)

_____ a. Provide preliminary grading for all proposed projects (including subdivisions, which intend to utilize lot by lot grading). Provide contours at a maximum of two-foot contour intervals. (**Note:** Statements that grading plans will be submitted at construction drawing submittal will not be accepted).

_____ b. Provide a preliminary storm drainage layout plan, which shows basic storm drainage locations. Preliminary pipe sizes are not required on internal storm drainage systems at site plan stage.

_____ c. Provide preliminary storm drainage easement sizes and locations. All storm drainage lines and easements should be located in open space as much as possible. Storm drainage easements cannot be shown as combined easements. The Engineering Division suggests that final plats should not be submitted until after construction drawings have been approved so that all easement locations will be correctly shown and dedicated.

_____ d. Provide typical sections for proposed surface drainage (ditches, swales, special features, etc).

_____ e. Label all retaining walls with preliminary top of wall and bottom of wall elevations.

_____ f. Provide finished floor elevations for all structures (buildings, concrete pads, pump stations, etc).

E. Proposed Development (utility plan sheet)

_____ a. Show and label all water and sanitary sewer lines as public or private. Preliminary sizes can be shown but are not required.

_____ b. Waterlines shall be located on the north and east side of roadways and sanitary sewer lines shall be located on the south and west side of roadways. All sanitary sewer outfalls shall be located in open space or common areas as much as possible.

_____ c. All sanitary sewer and waterlines shall provide for connectivity to adjacent properties as required or directed by the City of Durham Engineering Division.

_____ d. Show all water and sanitary sewer easements (combined easements are not allowed, but overlapping easements are acceptable).

_____ e. Show all valves, manholes, sewer cleanouts, hydrants, meters with sizes (1 ½" or larger in vault with 4" PVC drain, shown on plan). Sewer cleanouts located in traffic areas shall be labeled as traffic bearing cleanouts.

_____ f. Show all services at right-of-way line behind sidewalk if applicable. Show all backflow prevention devices needed outside of the right-of-way (in vault with 4" PVC drain or above ground hot box).

_____ g. All food service dumpsters and compactors are required to have drains to a sanitary sewer. Dumpster pads shall be designed to not allow any other surface drainage into sanitary sewer.

_____ h. If a sanitary sewer force main is proposed add a note stating that force main shall be ductile iron pipe per City of Durham Standards with a *Protecto 401* or equal lining. This is only required where water column separates from pipe and creates an air pocket (at high points with air release valves).

_____ i. If a site is using a well and proposes to provide a sanitary sewer service for project add a note stating a standard water meter is required to be installed on well for sanitary sewer billing purposes.

F. Proposed Development (Landscape plan)

_____ a. Show and label all easements (water, sewer and storm drainage conveyance systems).

_____ b. Remove all proposed vegetation in rights-of-way and easements.

_____ c. Where indicated by the City of Durham Engineering Division remove any existing or proposed landscaping in existing or future easements (if applicable to project).

G. Proposed Development (Special Conditions of Approval Box)

_____ a. In the special conditions of approval box, always add the following notes:

1. All sizes, materials, slopes, geometry, locations, evaluations, extensions and depths for all existing and proposed streets and utilities (waterlines, sanitary sewer lines and storm drainage conveyance systems) shall be designed to the specifications set forth in the design criteria and standards of the Public Works Department and be subject to review and approval by the Public Works Department at construction drawing submittal.
2. The designing professional (a NCPE, NCPLS or NCRLA – as required) will submit 3 sets of construction drawings to City Engineering for review and approval before starting construction (see Construction Plan Approval Process). **NOTE**: The approval of construction drawings is separate from site plan approval.

_____ b. In the special conditions of approval box, add the following notes as required:

1. **Extension Agreement required (submit after site plan approved but before construction plans).** Contact Engineering Division (560-4326, FAX 560-4316) with complete name (Individual, Inc., Corp., etc) and telephone number of entity extending services to the site.
2. **Annexation petition required.** Contact Budget Department @ 560-4111
3. If a hydrant is proposed a fire flow analysis is required. Waterline size may change with fire flow analysis. Contact City Engineering @ 560-4326 to schedule flow test or to obtain current system data.
4. Water and sewer permits are required for this project.
5. An executed stormwater facility operation and maintenance permit agreement (prepared by Stormwater Services, City of Durham), payment of a stormwater facility permit fee ($2,000 per detention / water quality device) and perpetual surety for the continued operation and maintenance of the facility is required prior to construction plan approval.
6. Back flow permit required with this project.
7. A NCDOT or City of Durham Driveway Permit is required.

City of Durham

Public Works Department

Engineering Division

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Engineering Final Plat Submittal Checklist

The following is a list of standard final plat requirements that are reviewed by the City of Durham Engineering Division at the final plat stage of Development Review. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required. Final Plat Submittals without the following minimum criteria will be returned to the applicant without a complete review being performed thus resulting in additional delays to the site plan process until the information is provided.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Company Name: _____

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met.

A. General Requirements

Applicant's initials (typical all sections)

_____ a. Show all of the following items: Project name, tax map #, PIN, township, date (original and all revisions), north arrow (labeled as true or magnetic with date or grid reference), and vicinity map that clearly locates site with readily recognizable landmarks.

_____ b. Provide the name, address, telephone number, facsimile number, and email address if applicable of professional with a seal, signature and date.

_____ c. Provide an index map with match lines for multiple sheets for all plans as needed.

_____ d. Graphic and numeric scale.

_____ e. Provide the surveyor's certificate of accuracy and mapping stating that the plat has been prepared in accordance with GS 47-30, as amended.

_____ f. Provide an owner's certificate with a notary certificate.

_____ g. Provide an attorney's certificate with a notary certificate **(REQUIRED FOR RIGHT-OF-WAY DEDICATION and PUBLIC EASEMENTS ONLY)**.

_____ h. Provide the exact boundary of property being subdivided with sufficient survey data to determine readily and reproduce on ground every line shown on boundary.

_____ i. Provide a graphical angle of departure of adjoining property lines.

_____ j. Provide a note stating the minimum driveway length shall be 20' from measured from the right-of-way or street easement line as applicable.

_____ k. Show all new property lines clearly distinguishable from existing, all lot areas; lot numbers shall run consecutively, required setbacks, typical lots and buffer limit lines, existing open space and other common areas. When more than one property is involved in request, all property lines should be shown and labeled as 'to remain' or 'hereby removed.' All parcels of land to be designated/dedicated/reserved for public/private use, shown with total land area, proposed use and boundary descriptions.

_____ l. Show all dimensions, both linear and angular with units, for boundaries of subdivision, lots, streets, alleys, public easements and show private easements. Linear dimensions expressed in feet and decimals of foot; all angular measurements shall be expressed by bearings.

_____ m. All curves shall be defined by radius, central angle (delta), tangent, arc and chord distances and chord bearings. Such curve data shall be expressed by curve table lettered on face of plat, each curve being tabulated and numbered to correspond with respective numbered curves shown throughout plat.

_____ n. Provide a description and location of all monuments shown. No plat showing plus or minus distances to monuments will be approved.

_____ o. Provide the names of abutting property owners with deed or tax map numbers.

_____ p. Provide the location, right-of-way width, names and purposes of street lines (labeled 'Public' or 'Private' and 'Existing').

_____ q. Show all alley lines, building lines, cemeteries, utility, storm drainage and other easements (with standard notes) defined by centerline bearings, distances and ties with property corners.

_____ r. Provide plat book and page number of all existing easements.

_____ s. Provide the townhome note per the Reference Guide for Development (see standard notes section) on all applicable developments.

_____ t. Definite tie, where convenient, between not less than two prominent points on exterior boundary of subdivision and precise traverse network of City of Durham on file in Engineering Division, either by bearing and distance or rectangular coordinates. In lieu of coordinate system ties, bearing and distance ties shall be furnished to existing recorded subdivision or block corner, where required. If there is not a tie to a monument within 2000', note on plat. **N/A FOR EXEMPT PLATS (see planning for requirements of Exempt Plats).**

_____ u. Two permanent control points labeled; an accurate description of all monuments, markers, and control points. **N/A FOR EXEMPT PLATS (see planning for requirements of Exempt Plats).**

_____ v. Provide a review officer stamp and new survey type certificate.

_____ w. Show all private water or sanitary sewer easements.

SECTION 1.2

TRANSPORTATION DIVISION SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT SUBMITTAL REQUIREMENTS

The following section provides a list, which should be used by the applicant before any site plan, preliminary plat or final plat submittals so that the applicants are aware of the minimum requirements in order to receive a complete review. The checklists in this section are intended as a guide and are not a submittal requirement with plans.

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City of Durham

Public Works Department

Transportation Division

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4366 FAX (919) 560-4561

Transportation Site Plan and Preliminary Plat Submittal Checklist

The following is a list of standard site plan and preliminary plat requirements that are reviewed by the City of Durham Transportation Division at the site plan stage of Development Review. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required. Site Plan and Preliminary Plat Submittals without the following minimum criteria will be returned to the applicant without a complete review being performed thus resulting in additional delays to the site plan or preliminary plat process until the information is provided.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Company Name: _____

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met.

A. Access Points

Applicant's initials (typical all sections)

_____ a. Less than 60 units – one public street access
_____ b. 60-90 units – 2 public street accesses or one divided access with no utilities
_____ c. More than 90 units or commercial development – 2 public street accesses
_____ d. Add a note on the plan regarding the limit of units before another access street is built
_____ e. Access points needed for connectivity.

B. Usability of Access Points

_____ a. Sight distances (horizontal and vertical alignments and obstructions)
_____ b. Landscaping in right-of-way or interfering with sight distance (sight triangle)
_____ c. Sight distance triangles for adjacent drives
_____ d. Relationship to other streets and drives (300' min. offset on residential streets)
_____ e. Entrance type (street type allowed if greater than 90 parking spaces)
_____ f. Driveway grades (10% max.)
_____ g. Turning radii (particularly fire access)
_____ h. Turning lanes (left and right turns in and out)

C. Adjoining Property

_____ a. Dedicated streets (are connections made or needed?)
_____ b. Land locking (is access to adjoining property needed?)

D. Thoroughfares

_____ a. Any proposed thoroughfares through the property (ROW and construction)
_____ b. Additional ROW needed on streets adjoining project

E. Street Design

_____ a. Meets Table of Minimum Design Requirements for Public and Private Residential Streets
_____ b. Sight Distance (vertical and horizontal curves, landscaping, signs etc.)
_____ c. Street grades
_____ d. Driveway spacing, width, location and distance from intersection
_____ e. Correct street and right-of-way width – according to street type
_____ f. Minimum centerline radius – as per design speed
_____ g. Maximum cul-de-sac length = 800'
_____ h. Minimum cul-de-sac bulb radius = 50' ROW
_____ i. Corner ROW radius or triangle needed?
_____ j. Tie into existing strip pave with curb and gutter. Curb and gutter to be terminated at proper width.
_____ k. Widening or construction of streets identified on the Urban Bicycle Route Plan must provide 14' wide outside through lanes.
_____ l. Is ROW 10 feet behind the back of curb? Is there a dedication of ROW?

F. Parking

_____ a. Parking location and control (maneuvering away from entrances and intersections)
_____ b. Parking stalls and aisle widths
_____ c. Handicapped parking requirement and van accessibility (size and signs) G.S. 20-37.6
_____ d. Is a complex source permit required?

G. Miscellaneous

_____ a. Dumpster location and access (turning radii)
_____ b. Fire access to all units and/or fire lanes for shopping centers and special occupancies
_____ c. Pedestrian access (internal and external sidewalks)
_____ d. Off-site improvements needed (signals, street widening, turn lanes at intersections, etc.)
_____ e. Traffic Impact Analysis required if peak hour generation > 150 trips
_____ f. Name and dimension cross-sections and right-of-way
_____ g. Dumpster pad size
_____ h. General notes

City of Durham

Public Works Department

Transportation Division

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4366 FAX (919) 560-4561

Transportation Final Plat Submittal Checklist

The following is a list of standard site plan requirements that are reviewed by the City of Durham Transportation Division at the Final Plat Stage of Development Review. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required. Final Plat Submittals without the following minimum criteria will be returned to the applicant without a complete review being performed thus resulting in additional delays to the site plan process until the information is provided.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Company Name: _____

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met.

Applicant's initials (typical all sections)

_____ a. Show required right-of-way and right-of-way dedication (from site plan)

_____ b. Make sure that the plat does not create any land locked parcels

_____ c. Make sure that the street names on the plat agree with the street naming convention of the City and County of Durham

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SECTION 1.3

STORMWATER SERVICES DIVISION REZONING, SITE PLAN, PRELIMINARY PLAT AND FINAL PLAT SUBMITTAL REQUIREMENTS

The following section provides a list, which should be used by the applicant before any rezoning, site plan, preliminary plat or final plat submittals so that the applicants are aware of the minimum requirements in order to receive a complete review. Additional copies of the checklists can be found at:

http://www.ci.durham.nc.us/departments/works/divisions/stormwater/design_plan_review.asp

The design checklists for rezoning, site plan and preliminary plat are to be submitted with all submittals, including resubmittals. Failure to submit these checklists and item requirements with each submittal will result in no review of the documents. Note final plat checklist is not a submittal requirement.

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DURHAM
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CITY OF MEDICINE

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Design Professional 's Signature and Seal

Stormwater Services Rezoning Plan Submittal Checklist

For each review submittal the entire study must be submitted. This includes re-submittals. Partial study packages will not be reviewed. Incomplete Stormwater Rezoning Plan Submittals will be returned with NO REVIEW PERFORMED. Contact Stormwater Services concerning redevelopment, expansion or projects which result in a decrease in impervious area for modified submittal requirements. This submittal checklist is to be submitted with each plan submittal.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Company Name: _____

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met and supporting documentation is attached.

A. General Requirements

Applicant's initials

_____ a. Stormwater Impact Analysis (SIA) including narrative report and drainage calculations sealed and signed by North Carolina Professional Engineer. (see Section 8.1 for requirements)

_____ b. Cape Fear / Neuse Basin (circle one).
(If Neuse Basin circled completion of **Section D.** below is required)

_____ c. INSIDE / OUTSIDE (circle one) Water Supply Watershed.
(If INSIDE Water Supply Watershed completion of **Section E.** below is required)

_____ d. Show all City of Durham and Neuse Basin Stream Buffers on the plan. Diffuse flow into stream buffers is required.

_____ e. Floodplain located on site: Yes / No (circle one). A copy of floodplain map with site boundary shown is required and the 100-year floodplain with base flood elevations (if applicable) must be shown on the site plan.

B. 10% Stormwater Rule Requirements

_____ a. Durham County Soils map with site boundary shown.

_____ b. USGS 7.5 Minute Quadrangle map with site boundary shown.

_____ c. Introduction narrative describing site conditions in pre- and post-development conditions including description of site improvement changes.

_____ d. Drainage area map including:

___ Site area delineated, scale and north arrow.

___ Sub-basins delineated for pre- and post-development conditions with area in acres indicated.

___ Analysis points clearly identified and labeled.

___ Segmented TR-55 time of concentration flow paths showing each segment.

_____ e. Methodologies and procedures described.

_____ f. Site plan or grading plan identifying pre- and post-development drainage patterns.

_____ g. Pre- and post-development times of concentration calculated using the TR-55 segmented approach.

_____ h. Calculations for the pre- and post-development discharges for the 2- and 10-year 24-hour storm using TR-55, TR-20, HEC-HMS, HEC-1 or Rational Method (50 acres or less).

_____ i. Summary of Results provided in the following format (see Example below).

BASIN NAME	***Pre-Developed 2-year discharge***	***Post-Developed 2-year discharge***	***% Increase***	***Pre-Developed 10-year discharge***	***Post-Developed 10-year discharge***	***% Increase***	***Detention Required (Yes/No)***	***Remarks***

_____ j. Conclusion providing detailed findings.

_____ k. BMP provided (indicate quantity): ___Wet pond ___Sand filter ___Bioretention ___Dry detention ___Other _____ ___ Not required

_____ l. BMP benefits: ___control 2- and 10-year discharge

___Other _____ ___Not required

_____ m. Downstream Analysis Provided _____ ___Not required

_____ n. Downstream Improvements Proposed with a signed notarized agreement with downstream property owner(s) Y / N

C. City of Durham Stream Buffers

_____ a. A copy of the Durham County Soils map and the USGS 7.5 Minute Quadrangle map with the site indicated has been provided. Diffuse flow into stream buffers is required

_____ b. All City of Durham stream buffers are shown on the plan for intermittent and perennial streams shown on the Durham County Soils map or the USGS 7.5 Minute Quadrangle map. Diffuse flow into stream buffers is required.

D. Neuse Basin Requirements[1]

Note: If a single family, duplex, or recreational development disturbs ≤ 1 acre or a multi-family, office, institutional, commercial or industrial development disturbs ≤ 0.5 acres then all items below are N/A except

[1] See Neuse Performance Standard Section 8.2 of the Reference Guide for Development for additional details.

item a and f. Additionally, new residential development may be exempt from the 1-year peak runoff control requirement if the impervious area does not exceed 15% and swales and other natural stormwater conveyances are used to the maximum extent practicable. Items a and f are still applicable for this case.

_____ a. Clearly label all Neuse Basin Buffers and describe any impact to the buffer. (Note that there is no acreage limit for Neuse buffered streams.) Contact NCDENR for evaluation of impacts on buffers.

_____ b. Pre- and post-development discharge calculations for the 1-year 24-hour storm using TR-55, TR-20, HEC-HMS or HEC-1. (1-year 24-hour storm rainfall is 3 inches)

_____ c. Summary of Results provided in the following format (see Example below).

BASIN NAME	***Pre-Developed 1-year discharge***	***Post-Developed 1-year discharge***	***% Increase***	***Detention Required (Yes/No)***	***Remarks***

_____ d. BMP provided (indicate quantity): ___Wet Pond ___Sand Filter ___Bioretention ___Dry Detention ___Other _____ ___ Not required

_____ e. BMP benefits: ___control 1-year discharge ___Other _____ ___Not required

_____ f. Pre- and post-development nitrogen calculations using City of Durham Nitrogen Calculation Tables.

E. Water Supply Watershed Requirements [2]

_____ a. Indicate the water supply watershed overlay district(s) the project is located. (Circle all that apply) (F/J-A, F/J-B, E-A, E-B, M/LR-A, M/LR-B)

_____ b. Provided BMP for 85% TSS removal or **narrative** explaining why it is not provided. Additional checklists are available for Sand Filters, Bioretention Areas, Wet Ponds and Dry Detention Ponds. These checklists are required with construction plan submittal.

_____

_____

_____ c. BMP provided: ___Wet Pond ___Sand Filter ___Bioretention ___Dry Detention ___Other _____ ___ Not required

_____ d. BMP benefits: ___85% TSS Removal ___Other _____ ___Not required

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee ($2,000 per facility) and payment of surety are required prior to construction drawing approval.

[2] See City of Durham Design Summaries and the NCDENR BMP Manual (latest edition) for additional details and BMP design requirements.

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City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Design Professional 's Signature and Seal

Stormwater Services Site Plan and Preliminary Plat Submittal Checklist

For each review submittal the entire study must be submitted. This includes re-submittals. Partial study packages will not be reviewed. Incomplete Stormwater Site Plan Submittals will be returned with NO REVIEW PERFORMED. Contact Stormwater Services concerning redevelopment, expansion or projects which result in a decrease in impervious area for modified submittal requirements. This submittal checklist is to be submitted with each plan submittal.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Company Name: _____

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met and supporting documentation is attached.

A. General Requirements

Applicant's initials

_____ a. Stormwater Impact Analysis (SIA) including narrative report and drainage calculations sealed and signed by North Carolina Professional Engineer. (see Section 8.1 for requirements)

_____ b. Cape Fear / Neuse Basin (circle one).
(If Neuse Basin circled completion of **Section D.** below is required)

_____ c. INSIDE / OUTSIDE (circle one) Water Supply Watershed.
(If INSIDE Water Supply Watershed completion of **Section E.** below is required)

_____ d. Show all City of Durham and Neuse Basin Stream Buffers on the plan. Diffuse flow into stream buffers is required.

_____ e. Floodplain located on site: Yes / No (circle one). A copy of floodplain map with site boundary shown is required and the 100-year floodplain with base flood elevations (if applicable) must be shown on the site plan.

B. 10% Stormwater Rule Requirements

_____ a. Durham County Soils map with site boundary shown.

_____ b. USGS 7.5 Minute Quadrangle with site boundary shown.

_____ c. Introduction narrative describing the site conditions in pre- and post-development conditions including a description of site improvement changes.

_____ d. Drainage area map including:

___ Site area delineated, scale and north arrow.

___ Sub-basins delineated for pre- and post-development conditions with area in acres indicated.

___ Analysis points clearly identified and labeled.

___ Segmented TR-55 time of concentration flow paths showing each segment.

_____ e. Methodologies and procedures described.

_____ f. Site plan or grading plan identifying pre- and post-development drainage patterns.

_____ g. Pre- and post-development times of concentration calculated using the TR-55 segmented approach.

_____ h. Calculations for the pre- and post-development discharges for the 2- and 10-year 24-hour storm using TR-55, TR-20, HEC-HMS, HEC-1 or Rational Method.

_____ i. Summary of Results provided in the following format (see Example below).

BASIN NAME	***Pre-Developed 2-year discharge***	***Post-Developed 2-year discharge***	***% Increase***	***Pre-Developed 10-year discharge***	***Post-Developed 10-year discharge***	***% Increase***	***Detention Required (Yes/No)***	***Remarks***

_____ j. Conclusion providing detailed findings.

_____ k. BMP provided (indicate quantity): ___Wet Pond ___Sand Filter ___Bioretention ___Dry Detention ___Other _____ ___ Not required

_____ l. BMP benefits: ___control 2- and 10-year discharge

___Other _____ ___Not required

_____ m. Downstream Analysis Provided _____ ___Not required

_____ n. Downstream Improvements Proposed with a signed notarized agreement with downstream property owner(s) Y / N

C. City of Durham Stream Buffers

_____ a. A copy of the Durham County Soils map and the USGS 7.5 Minute Quadrangle with the site indicated has been provided. Diffuse flow into buffers is required.

_____ b. All City of Durham stream buffers are shown on the plan for intermittent and perennial streams shown on the Durham County Soils map or the USGS 7.5 Minute Quad. Diffuse flow into buffers is required.

D. Neuse Basin Requirements[3]

Note: If a single family, duplex, or recreational development disturbs ≤ 1 acre or a multi-family, office, institutional, commercial or industrial development disturbs ≤ 0.5 acres then all items below are N/A except

[3] See Neuse Performance Standard Section 8.2 of the Reference Guide for Development for additional details.

item a and f. Additionally, new residential development may be exempt from the 1-year peak runoff control requirement if the impervious area does not exceed 15% and swales and other natural stormwater conveyances are used to the maximum extent practicable. Items a and f are still applicable for this case.

_____ a. Clearly label all Neuse Basin Buffers and describe any impact to the buffer. (Note that there is no acreage limit for Neuse buffered streams.) Contact NCDENR for evaluation of impacts on buffers.

_____ b. Pre- and post-development discharge calculations for the 1-year 24-hour storm usingTR-55, TR-20, HEC-HMS or HEC-1. (1-year 24-hour storm rainfall is 3 inches)

_____ c. Summary of Results provided in the following format (see Example below).

BASIN NAME	***Pre-Developed 1-year discharge***	***Post-Developed 1-year discharge***	***% Increase***	***Detention Required (Yes/No)***	***Remarks***

_____ d. BMP provided (indicate quantity): ___Wet Pond ___Sand Filter ___Bioretention ___Dry Detention ___Other _____ ___ Not required

_____ e. BMP benefits: ___control 1-year discharge ___Other _____ ___Not required

_____ f. Pre- and post-development nitrogen calculations using City of Durham Nitrogen Calculation Tables.

_____ g. Nitrogen buy-down calculations (if necessary). Site plan will not be approved until WRF payment is verified.

E. Water Supply Watershed Requirements [4]

_____ a. Indicate the water supply watershed overlay district(s) the project is located. (Circle all that apply) (F/J-A, F/J-B, E-A, E-B, M/LR-A, M/LR-B)

_____ b. Provided BMP for 85% TSS removal or **narrative** explaining why it is not provided. Additional checklists are available for Sand Filters, Bioretention Areas, Wet Ponds and Dry Detention Ponds. These checklists are required with construction plan submittal.

_____

_____

_____ c. BMP provided: ___Wet Pond ___Sand Filter ___Bioretention ___Dry Detention ___Other _____ ___ Not required

_____ d. BMP benefits: ___85% TSS Removal ___Other _____ ___Not required

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee ($2,000 per facility) and payment of surety are required prior to construction drawing approval.

[4] See City of Durham BMP Design Summaries and the NCDENR BMP Manual (latest edition) for additional details and BMP design requirements.

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City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Stormwater Services Final Plat Submittal Checklist

The following is a list of standard final plat requirements that are reviewed by the City of Durham Stormwater Services Division at the final plat stage of Development Review. This list is intended to give general guidelines only and is not to be considered all-inclusive. Depending upon the development additional items may be required. Final plat submittals without the following minimum criteria will be returned to the applicant without a complete review being performed.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Company Name: _____

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines submittal requirements. Initial in the space provided to indicate the following submittal requirements have been met.

A. General Requirements

Applicant's initials (typical all sections)

_____ a. Show all easements for stormwater system and BMPs (including the access easement for the BMP).

_____ b. Show all floodplains with map number, date and zones. Note that the NFIP map number, date and zone must be shown even if no floodplain is indicated.

_____ c. Show all impervious surface areas per lot as required by zoning overlay.

_____ d. Show all required stream buffers.

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SECTION 2.0

PUBLIC WORKS DEPARTMENT ENGINEERING, TRANSPORTATION AND STORMWATER SERVICES DIVISIONS AND THE CONSTRUCTION DRAWING PROCESS

The following information is to provide a basic overview of the roles of the above divisions as they relate to the construction drawing review process. However it should be noted that all plan and calculation submittals **must always** be directed to the City of Durham Engineering Division for distribution to the appropriate Division. Status inquires and correspondences associated with these processes can be directed to the individual reviewer of each Division.

ENGINEERING:

The City of Durham Engineering Division is located on the 3rd floor of City Hall. The Development Review Group is the main contact in the Engineering Division for all Engineering comments that are returned on construction drawings. The Development Review Group can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Development Review Group, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Engineering Division is tasked with reviewing construction documents as these items relate to the City of Durham public and private road standards, driveways, sidewalks, water systems, fire protection systems, sanitary sewer systems, stormwater drainage and conveyance systems and easements for these systems.

The City of Durham Engineering Division is tasked with distribution of all incoming construction drawings, including resubmittals, and design calculation to the Transportation and Stormwater Services Divisions.

The typical time line for review of construction drawings is approximately 10 business days from the day of receipt of the documents by the City of Durham Engineering Division. The typical time line for review of all resubmittals is approximately 10 business days from the day of receipt of the documents by the City of Durham Engineering Division.

TRANSPORTATION:

The City of Durham Transportation Division is tasked with reviewing construction documents as they pertain to traffic control devices, signs, pavement markings, lane widths, design and traffic control of roundabouts and placement and design of traffic calming measures. The Transportation Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 4th Floor, Transportation Division, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4366 and fax number is (919) 560-4561.

The typical time line for review of construction drawings is approximately 10 business days from the day of receipt of the documents from the City of Durham Engineering Division. The typical time line for review of all resubmittals is approximately 10 business days from the day of receipt of the documents from the City of Durham Engineering Division.

STORMWATER SERVICES:

The City of Durham Stormwater Services Division is located on the 3rd floor of City Hall. The Stormwater Services Division is the contact in the Public Works Department for all stormwater analysis comments that are returned on construction drawings. The Stormwater Services Division can be contacted by mail at the following address: Public Works Department, City of Durham, 101 City Hall Plaza, 3rd Floor, Stormwater Services Division, Durham, North Carolina, 27701. The contact phone number for questions is (919) 560-4326 and fax number is (919) 560-4316.

The City of Durham Stormwater Services Division is tasked with reviewing construction drawing documents as these items relate to stormwater impact studies, stream buffers, floodplain analysis, stormwater quality systems and stormwater quantity facilities, as well as major stream crossing systems (culverts, spanning systems, etc.).

The typical time line for review of construction drawings is approximately 10 business days from the day of receipt of the documents from the City of Durham Engineering Division. The typical time line for review of all resubmittals is approximately 10 business days from the day of receipt of the documents from the City of Durham Engineering Division.

WHAT TYPES OF PLANS NEED TO BE SUBMITTED FOR CONSTRUCTION PLAN APPROVAL

This section is intended to notify the Engineer and the Developer of those plans that need to be submitted to the City Engineering Division for Construction Plan review and approval before construction can begin. Note: Construction plan approval process begins after Zoning and Site Plan approval.

General

Confirm that the site plan has valid approval. This generally will be a plan indicating the improvements, which will have the Planning Department's Site Plan Approval stamp. Be aware that some plans may have expiration dates. If there is any question about the validity of the plan contact the City/County Planning Department.

Type of Development	**Construction Plan Required**	**Refer to Section**
Commercial/Institutional/Educational		
Only if any items are listed as 'Yes' in Specific Improvements below	Yes	2.0-2.5
Multifamily	Yes	2.0-2.5
Subdivision	Yes	2.0-2.5

Specific Improvements	**Construction Plan Required**	**Refer to Section**
Water Supply		
Service (lateral)	No	Building Inspections
Water main extension	Yes	5.0
Fire Line	Yes	6.0
Backflow Prevention (BFP outside of buildings)	Yes	6.0
Hydrant Installation	Yes	5.0
Sanitary Sewer System		
Service (lateral)		
4" line (1 building)	No	Building Inspections

Type of Development	Construction Plan Required	Refer to Section
4” line (2 or more buildings)	Yes	7.0
6" line that services only 1 building w/out 4 hour fire walls	No	Building Inspections
All others	Yes	7.0
Extensions		
Mains (Any pipe 6" or greater)	Yes	7.0
Outfalls	Yes	7.0
Pump Stations/force mains	Yes	7.0
Industrial	Yes	Environmental Resources
See Service or Extension (above)		As required

Specific Improvements	Construction Plan Required	Refer to Section
Storm Drainage System		
Pipe in right-of-way	Yes	8.0
Any pipe or conveyance of 15" equivalent diameter or larger	Yes	8.0
Water Quality/Quantity Basins	Yes**	8.3
Crossing public easements	Yes	8.0
Onsite drainage	Yes	8.0
Streets (public or private)	Yes	9.0
Driveway		
Commercial		
With approved site plan	No*	
Site plan not required	Yes*	9.0
Residential-multifamily		
With approved site plan	No*	

Type of Development	Construction Plan Required	Refer to Section
Site Plan not required	Yes*	9.0
Single Family		
Existing street	No*	
Site Plan not required	Yes*	9.0
Sidewalk		
With approved site plan	No*	
Without site plan	Yes*	11.0

* Permit required from the City of Durham Engineering Division and/or from NCDOT.

** Permit fee, surety, and executed agreement required prior to construction drawing approval.

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SECTION 2.1

CONSTRUCTION PLAN APPROVAL PROCESS

This section is intended to aid in the process of construction plan submittal.

I. Before Submitting Construction Plans

1. A valid, DRB approved site plan must be obtained before submitting construction drawings. A single construction drawing review will be granted after DRB approval but before the site plan is actually signed, which is indicated by the Planning Department's approval stamp and signature. After the first review of construction drawings, a signed and stamped site plan must be obtained from the Planning Department and submitted with the second construction drawing review submittal in order for a second construction drawing review to be granted or construction drawings can be approved. Be aware that some plans may have expiration dates. If there are any questions contact the City/County Planning Department at (919) 560-4137.
2. Some projects require additional approvals that are beyond local authority (for example: erosion control permits, wetland permits). The Durham City Engineering Division requires that all appropriate agencies be contacted and approvals for the plans must be obtained. Even if the City Engineering Division does not ask for proof of approvals, it does not relieve the applicant from obtaining them.
3. If water and/or sanitary sewer lines are extended outside the City Limits, an Extension Agreement Application shall be submitted to the City Engineering Division. In addition, an Annexation Petition Package must be submitted to the City of Durham Budget and Management Services (919) 560-4111. The Extension Agreement will be prepared by Engineering Division and submitted to the owner for signatures. A fully executed (completed with signatures and approval by City Council) Extension Agreement is required prior to Construction Drawing Approval outside the City Limits. If the site is located within the City Limits the Engineering Division may require an Extension Agreement Application to be submitted. If the Extension Agreement application is required the completed Extension agreement with signatures must be submitted to Engineering before construction drawing approval. A copy of the Extension Agreement Application and description of the process is located in Section 13.0 FORMS.
4. Developers shall engage the services of a Professional Engineer registered in the State of North Carolina (NCPE) to prepare, sign and seal plans and specifications for the construction of all streets, water, sanitary sewer and applicable storm drainage systems and structures (Developers may also engage the services of a registered Professional Land Surveyor or Landscape Architect registered in the State of North Carolina to prepare, sign, seal plans and specifications for the construction of streets and applicable storm drainage systems and structures). For more detailed requirements of these construction plans see also the Sections 2.3 CONSTRUCTION PHASE through Section 12.0 STANDARD NOTES of the Reference Guide for Development.
5. Sanitary sewer pump stations for projects will require coordination with the City Engineering Division prior to submittal of site plan or construction plans. This is to determine if the station is feasible and to determine the design parameters that apply.

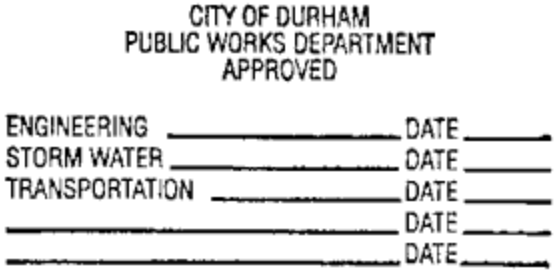
II. Construction Plan Approval Process

1. **The construction drawings for each division, along with appropriate fees, will be submitted to the City of Durham Engineering Division as required by the Construction Plan Submittal Requirements (see Section 2.3). The City of Durham will review the submittals for completeness within 16 business hours after receipt of submittal. If all of the required items for each Division are not included in the submittal, the entire submittal set will be rejected. The contact person listed on the submittal form will be notified and told to pick up the rejected submittal with a redlined list of the missing items. All accepted submittals will be distributed to each division for review. When the reviews are completed the project contact person will be notified that any comments are available for pickup at the City of Durham Engineering Division located on the 3rd floor of City Hall. Included with the comments (either in letter**

format or redlined on cover sheet) will be instructions to the consultants as to the next step in the construction plan submittal process.

2. **When plans have completed the entire review cycle, the consultant will be instructed to provide all stormwater fees, surety and maintenance agreements (if applicable – see note below) and to submit original drawings (reproducibles) for final review, sealing and signoff by the Engineering, Transportation and Stormwater Services Divisions (*see sample of stamp at the end of this section*).**

Note: Permit fee, surety and executed maintenance agreements for stormwater quality or quantity best management practices are required prior to construction plan approval. No plans will be allowed to proceed to the permitting stage until all of these items are completed.



III. Construction Plan Permitting Process

After construction plans are approved and signed by all applicable divisions, the applicant will receive signed reproducibles and a City of Durham Transmittal Letter (see end of this section). The transmittal letter will indicate what permit forms are required, the number of approved construction document copies that are needed and permit fees that are required for the project.

The applicant is required to resubmit the required number of permit forms, fees and approved signed construction documents copies to the City of Durham Engineering Division and/or the State of North Carolina as directed by the City of Durham Transmittal. The City will review the permit applications for accuracy and compliance with all requirements. The review takes approximately 10 business days. All City of Durham approved permit applications are issued at the end of the review period. **CITY OF DURHAM PERMITS ARE NOT IMMEDIATELY ISSUED AFTER SUBMITTAL OF PERMIT APPLICATIONS**. Permit applications, which require State of North Carolina approval or North Carolina Department of Transportation approval, require substantial additional review by those agencies and the City of Durham does not issue these permits and is not responsible for delays in acquiring these permits.

Typical permits which are submitted and/or issued by the City of Durham include public/private water mains (permitted by City of Durham), public/private sanitary sewer mains (permitted by City of Durham and/or the State of North Carolina), and public sanitary sewer pump stations (submitted by City of Durham to the State of North Carolina and issued by the State of North Carolina). NCDOT utility and sidewalk encroachment agreements (submitted by City of Durham to NCDOT) are issued by NCDOT.

Please note that a variety of permitting situations apply for sanitary sewer inside Durham County and the City of Durham and that the applicant should pay special attention to these situations and to the City of Durham Transmittal letter. Certain situations will require that the applicant submit plans for review and/or permitting to the State of North Carolina through *Durham County Engineering* or directly to the State of North Carolina. These situations often involve longer review periods before permits are issued by those review agencies.

SEE ALSO SECTION 3 PERMITTING

City of Durham
Public Works Department

101 City Hall Plaza, Durham, North Carolina 27701
Telephone (919)560-4326 FAX (919)560-4316

LETTER OF TRANSMITTAL

TO: _____ **DATE:** _____

_____

_____

FROM: _____ Ext. Agreement Needed _____ CC Signed: _____

Annex. Offer: _____ Annex # 200 _____ - _____

RE: _____

_____

COMMENTS:

*** Allow a minimum of two weeks after submittal for the processing of any items listed below**

We are returning to you the original reproducible plans for the above mentioned project. These plans have been stamped and signed by the City of Durham Public Works Department. Complete the items marked below

☐	1.		Complete the attached Project Information sheet and submit with **5 sets** of plans. From these engineering inspection and frontage fees will be assessed. These fees are to be paid before starting construction.
☐	2.	a.	Complete a City of Durham Gravity Sewer Extension Permit Application and submit **2 sets** of plans and a **$450 check made payable to City of Durham.** If applicable, submit separate co-applications for public sewer and private sewer. Approved sewer permit required before starting sewer construction.
☐		b	Complete the attached NCDENR application, listing the City of Durham as applicant, and submit with **1 set** of plans and a **$400 check made payable to NCDENR.** Approved sewer permit required before starting sewer construction (County drainage basin, inside city limits, Public)
☐		c.	Complete the attached NCDENR application, listing the Developer as applicant, and submit with **1 set** of plans and a **$400 check made payable to NCDENR.** Approved sewer permit required before starting sewer construction (County drainage basin, inside city limits, Private)
☐		d.	The project is within the County jurisdiction. Obtain a sewer permit from NCDENR and coordinate with Durham County (919) 560-0735 to obtain acceptance letter. Approved sewer permit required before starting sewer construction.
☐		e.	This project contains a pump station and force main. Complete the attached NCDENR application, listing City of Durham/Developer (Public/Private) as applicant, and submit with **2 sets** of plans and a **$400 check made payable to NCDENR.** Approved pump station permit required before starting construction.
☐	3.		Complete a City of Durham Water Extension Permit Application and submit **3 sets** of plans and **$300 check made payable to City of Durham.** Approved water permit required before starting water main construction.
☐	4.		Submit 1 copy of plans showing a signage and pavement markings.
☐	5.		Submit 6 **folded sets** of the sheet (s) that have the sewer and/or water main improvements shown, within NCDOT ROW and submit a completed three (3) party encroachment agreement. Plans should have all SR# and a tie-down reference. NCDOT encroachment agreement required before working within NCDOT ROW.
Always	6.		Contact City of Durham Engineering Inspections at (919-560-4326) 48 hours prior to having a preconstruction meeting. The contractor must have the latest edition of permitted drawings at this meeting.
☒	7.		At completion of project, submit **3 sets** of as-built drawings, showing inverts of all manholes and inlets, line sizes and slopes, and the location of all meters, fire hydrants, valves, clean-outs, storm drainage, BMPs, etc. Engineering or Stormwater inspections may have other items required for as-builts. See section 4 of Review Guide for Develepment.
☐	8.		Other items are as follows:

NOTE: Other permits may be required for this project (erosion control, NCDOT driveway, etc...). These permits and the items listed above must be obtained/complied with before starting construction or the project may be stopped during construction until these items have been addressed.

(Revised September 2004)

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SECTION 2.2

CONSTRUCTION PLAN SUBMITTAL REQUIREMENTS

The following introduction is used to describe the construction drawing submittal procedure developed to decrease the number of submittals required to obtain construction drawing approval. This procedure was designed and implemented due to concerns in the development community that plan submittals were taking a significant amount of time to be approved and returned so that the permitting could be completed and the construction process could begin.

The consultant shall prepare constructions drawings in accordance with the approved site plan and the City of Durham Reference Guide for Development. The consultant shall then provide a construction drawing submittal package to the City of Durham Public Works Department located at 101 City Hall Plaza, 3rd Floor, Durham, NC 27701. A construction drawing submittal package shall contain the following items:

- A completed original of the City of Durham *Public Works Construction Drawing Submittal Checklist* and shall include all items indicated in the checklist as required for the Engineering Division. All items for the Engineering Division shall be bound together.
- A completed copy of the City of Durham *Public Works Division Construction Drawing Submittal Checklist* and shall include all items indicated in the checklist as required for the Transportation Division. All items for the Transportation Division shall be bound together.
- A completed copy of the City of Durham *Public Works Division Construction Drawing Submittal Checklist* and shall include all items indicated in the checklist as required for the Stormwater Services Division. All items for the Stormwater Services Division shall be bound together.
- Appropriate Construction Drawing Review Fee in the form of a check made payable to the City of Durham. Construction Drawings which include plan and profile sheets will be charged $450.00 fee. For projects that do not require plan and profile sheets, a $200.00 fee will be charged.

All submittals will be reviewed for completeness by the end of the second business day after receipt. ***Incomplete submittals for any division will cause the entire submittal to be rejected from the review process.*** Rejected submittals can be resubmitted for a completeness review the next business day, provided the missing information has been added to the submittal.

Responses to construction drawing comments directly on the redlined plans or in letter format are encouraged.

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DURHAM
1 8 6 9
CITY OF MEDICINE

City of Durham

Public Works Department

CONSTRUCTION DRAWING SUBMITTAL CHECKLIST

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Construction Drawing Submittal Checklist **Date Submitted:** _____

The applicant should complete all information listed below for all sections of the proposed project. Incomplete applications will be returned. Applicants should note all submittal guidelines as noted Section 2.2.

I. PROJECT INFORMATION

Project Name: _____ Phase: _____

Previous Project Name, if applicable: _____

PIN: _____ Tax Map Number _____ Planning Case Number: _____

Project Comment Contact Person: _____ Phone number ( ) _____

Fax number: ( ) _____ Email Address: _____

Company Name: _____

II. ACTION REQUESTED

- ☐ a. 1st Construction Drawing Submittal……Included Fee* ☐ $200 ☐ $450
- ☐ b. 2nd Construction Drawing Submittal
- ☐ c. Other: _____
- ☐ d. Original/Reproducible Construction Drawing Submittal for signatures

Comments:

***Any Construction Drawings which include plan and profile sheets will be charged $450.00. Otherwise, $200.00 will be charged. Fee is applicable for the initial submittal only.**

III. ENGINEERING REQUIRED ITEMS CHECKLIST

Engineering Construction Drawing Submittal Checklist

The following is a list of construction drawing items that are required by the City of Durham Engineering Division in order to review construction drawings. This list is intended to give general guidelines only and is not to be considered all-inclusive or project specific. Initial in the space provided to indicate the following submittal requirements have been met. Items that do not apply to the specific project are not required and the applicant should note "N/A" or "---" for those specific items. Depending upon the development additional items may be required as a part of the construction drawing process so that a submittal can be thoroughly reviewed. Construction drawing submittals without the following minimum criteria will be returned to the applicant without a review being performed thus resulting in additional delays to the construction drawing process until the information is provided. Note that all project name changes must be identified or considerable delays may occur.

A. Engineering Construction Drawing Submittal Requirements

Applicant's initials (typical all sections)

_____ a. 1 copy of completed extension agreement application with a copy of the proposed overall utility sheet if required by the Public Works Department.
_____ b. 1 set of Construction Plans for Review (sheet size of 24" x 36" only - to scale).
_____ c. 1 copy of drainage system calculations (includes pipes with hydraulic grade line calculations, permanent swales with shear stress calculations and drainage maps).
_____ d. 1 copy of gutter spread calculations (as required by the Reference Guide for Development).
_____ e. 1 copy of culvert calculations (as required by the Reference Guide for Development).
_____ f. 2 copies of fire flow analysis for each individual phase and full project buildout if applicable (as required by the Reference Guide for Development).
_____ g. 1 copy of the site plan from the City/County Planning Department with Status of DRB action (1st construction drawing submittal only).
_____ h. 2 copies of all private/public pump station design calculations and plans.
_____ i. Redlined construction drawings for Engineering Division.
_____ j. Redlined drainage system calculations.
_____ k. Redlined gutter spread calculations.
_____ l. Redlined culvert calculations.
_____ m. Redlined fire flow analysis.

B. Engineering Original Submittal Requirements (Note all report covers must contain the property identification numbers and project names)

Applicant's initials (typical all sections)

_____ a. 1 set of original signed/sealed reproducible Construction Drawings for signature (24" x 36" plan size only to scale). Construction Drawings should include the originals for Engineering, Transportation, and Stormwater Services Divisions.
_____ b. 1 copy of original signed/sealed drainage system calculations.
_____ c. 1 copy of original signed/sealed gutter spread calculations.
_____ d. 1 copy of original signed/sealed culvert calculations.
_____ e. 1 copy of original signed/sealed fire flow analysis.

IV. TRANSPORTATION REQUIRED ITEMS CHECKLIST

Transportation Construction Drawing Submittal Checklist

The following is a list of construction drawing items that are required by the City of Durham Transportation Division in order to review construction drawings. This list is intended to give general guidelines only and is not to be considered all-inclusive or project specific. Initial in the space provided to indicate the following submittal requirements have been met. Items that do not apply to the specific project are not required and the applicant should note "N/A" or "---" for those specific items. Depending upon the development additional items may be required as a part of the construction drawing process so that a submittal can be thoroughly reviewed. Construction drawing submittals without the following minimum criteria will be returned to the applicant without a review being performed thus resulting in additional delays to the construction drawing process until the information is provided. Note that all project name changes must be identified or considerable delays may occur.

A. Transportation Construction Drawing Submittal Requirements

Applicant's initials (typical all sections)

_____ a. 1 cover sheet with special conditions of approval requirements (sheet size of 24" x 36" only - to scale).
_____ b. 1 copy of all road widening drawings (public, private or NCDOT) (sheet size of 24" x 36" only - to scale).
_____ c. 1 copy of signing and marking drawings (as applicable) (sheet size of 24" x 36" only - to scale).
_____ d. Standard signing and marking notes included on plans (sheet size of 24" x 36" only - to scale).
_____ e. Standard signing and marking details included on plans (sign details, pavement marking details, street marker details, etc.) (sheet size of 24" x 36" only - to scale).
_____ f. 1 copy of the site plan from the City/County Planning Department with Status of DRB action (1st construction drawing submittal only).
_____ g. 1 copy of redlined signing and marking drawings.
_____ h. 1 copy of redlined road widening drawings.

V. STORMWATER SERVICES REQUIRED ITEMS CHECKLIST

Stormwater Services Construction Drawing Submittal Checklist

The following is a list of construction drawing items that are required by the City of Durham Stormwater Services Division in order to review construction drawings. This list is intended to give general guidelines only and is not to be considered all-inclusive or project specific. Initial in the space provided to indicate the following submittal requirements have been met. Items that do not apply to the specific project are not required and the applicant should note "N/A" or "---" for those specific items. Depending upon the development additional items may be required as a part of the construction drawing process so that a submittal can be thoroughly reviewed. Construction drawing submittals without the following minimum criteria will be returned to the applicant without a review being performed thus resulting in additional delays to the construction drawing process until the information is provided. Note: BMP design summaries in Section 8.4 must be submitted with the first submittal of construction drawings and must be completely filled out or the construction drawings will be rejected. The design summaries must be submitted with each additional submittal if there are changes to the BMP. Note that all project name changes must be identified or considerable delays may occur.

A. Stormwater Services Construction Drawing Requirements

Applicant's initials (typical all sections)

_____ a. 1 set of Construction Plans for Review (sheet size of 24" x 36" only - to scale).
_____ b. 1 copy of drainage system calculations (as required by the Reference Guide for Development and includes pipes with hydraulic grade line calculations, permanent swales with shear stress calculations and drainage maps).
_____ c. 1 copy of gutter spread calculations (as required by the Reference Guide for Development).
_____ d. 1 copy of culvert calculations (as required by the Reference Guide for Development).
_____ e. 1 copy of the site plan from the City/County Planning Department with Status of DRB action (1st construction drawing submittal only).
_____ f. 1 copy of approved stormwater impact analysis. Note if any changes have been made to the site plan that affect the analysis, a revised analysis must be submitted and a revised site plan may be required. Additional time may be required to review the revised analysis.
_____ g. 1 copy of each stormwater BMP design summary completely filled out with attached design calculations.
_____ h. Redlined construction drawings.
_____ i. Redlined drainage system calculations.
_____ j. Redlined final impact analysis. Note if any changes have been made to the site plan that affect the analysis, a revised analysis must be submitted and a revised site plan may be required. Additional time may be required to review the revised analysis.
_____ k. Redlined stormwater BMP design summary and calculations.
_____ l. Redlined culvert calculations.

B. Stormwater Services Original Submittal Requirements (Note all report covers must contain the property identification numbers and project names)

Applicant's initials (typical all sections)

_____ a. 1 copy of original signed/sealed drainage system calculations.
_____ b. 1 copy of original signed/sealed gutter spread calculations.
_____ c. 1 copy of original signed/sealed final impact analysis.
_____ d. 1 copy of original signed/sealed BMP design summary and calculations.
_____ e. 1 copy of original signed/sealed culvert calculations.

SECTION 2.3

CONSTRUCTION PHASE

I. Starting Construction

Construction cannot begin until:

1. Construction drawings have been approved and have been sealed (see *stamp at end of this section) and signed.
2. Proper permits and/or encroachments have been obtained.
3. Verify that all fees have been paid.
    1. These fees are mailed if there is/are water mains (permit), sanitary sewer mains (permit) or streets to be constructed with the project.
    2. Other projects that require Construction Drawing Approval will require an inspection fee to be applied for and paid for at City Engineering.
4. Contact Durham Engineering Inspections for a pre-construction conference no less than 48 hours before starting construction.

II. During Construction

During construction of a project, the following shall be kept on site at all times:

1. A set of approved drawings, and all revisions.
2. A copy of all permits, including water, sanitary sewer, driveway and sediment and erosion control.
3. A set of drawings showing as-built locations of valves, manholes, catch basins, meters, clean-outs, storm drain pipes, culverts, etc.

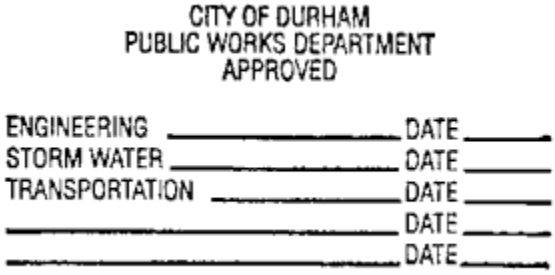
III. Completing Construction (Closing Construction Plan Process)

After all construction is complete the project is not closed until the following items are completed::

1. The project is complete and is acceptable to the City Engineering Inspection Section.
2. If the following items apply to the approved construction drawings or site plan, they must be completed prior to a certificate of occupancy will be released:
    - Complete sidewalk and have it inspected
    - Dedicate easements
    - Dedicate right-of-way
    - Final right-of-way and driveway inspection approved
    - Complete turn lanes if applicable
    - Complete stormwater collection system and approved and completed water quality/quantity basins.
    - Complete water and sanitary sewer, streets and accepted
    - Complete roadway construction, including acceptance, except the top 1" of I-2 asphalt. This 1" course shall be installed between 6 and 12 months after initial 1 1/2" course. At the discretion of the City of Durham, posting a bond will be required for this 1" course.
    - Utility mainline construction permits for each utility installed
    - The responsible party for each pavement cut identified
3. The Developer shall furnish the City Engineering Division as-built drawings as described in Section 4.0 As-built Drawings. If a right-of-way map is required for public water, sanitary sewer and stormwater easements, the developer shall provide a mylar copy of the right-of-way map.
4. The Developer shall provide a 1-year warranty on the improvements from date of acceptance (a letter of acceptance will be issued by the City of Durham Public Works Department).

5. The Engineer shall submit certification pursuant to state water and sanitary sewer permits and storm water facilities (water quality/quantity basins).

*Approval Stamp that will appear on the original Construction Drawings for sign-off:



Approval Stamp in PDF format - Acrobat Reader required.

SECTION 2.4

CONSTRUCTION DRAWING PLAN CHECKLIST

A registered Professional Engineer with the State of North Carolina shall prepare the plans (signed and sealed) for improvements to the water mains, sanitary sewer lines, street improvements and storm drainage systems and structures (see also Sections 2.5 Profile Checklist, 5.0 Water Supply, 7.0 Sanitary Sewer System, 8.0 Stormwater and 9.0 Streets,). A registered Professional Land Surveyor or Landscape Architect with the State of North Carolina may also be used to prepare street improvements and storm drainage systems and structures. *The following is intended as a guide in the preparation and submitting of plans for public and private improvements for water lines, sanitary sewer lines, street construction and storm drainage systems and structure improvements.*

The City Engineering Division's position is one of review and not of detailed checking. Plans found deficient will result in the rejection of the plans and could delay the entire approval process. Note that plan and profile must be shown on the same sheet and must be shown in the same direction.

I. General for All Improvements

___ Sheet size to be only 24" x 36".

___ Plan and profile sheets are required (see also Section 2.5 Profile Checklist).

___ North arrow.

___ Tax map number written in the upper right corner.

___ Parcel Identification Number (PIN).

___ A clear vicinity map (shown on the cover sheet or in the upper right corner) clearly showing location of site with respect to existing streets.

___ Site map (showing overall limits of improvements on the coversheet or in the upper right corner).

___ Bench mark shown and described on each plan and profile page. All elevations to be true and not assumed.

___ Cover sheet with all consultants and developers, telephone number, address and email address, project name (any former names), planning case number and entire special conditions of approval.

___ All consultant seals and signatures.

___ Does tree protection fence exactly match the site plan tree protection fence? (If not, contact the Planning Department as a revised site plan may be necessary).

___ Title block with street or project title, scale, original date, revision date(s), drawing number, checked by, drawn by all in the lower right hand corner (see typical plan and profile drawing at the end of this section).

___ Area for approval stamp (see Section 13.0 Forms for the Public Works Department stamp) on right side of sheet.

___ Note indicating that:

City of Durham standards and specifications are to be used.

___ Clearing limits shown.

Note: If the clearing limits are different than what was approved on the site plan, the plan will need to be signed off by the Planning Department. This could require that the plan go through the entire Development Review Board (DRB)/Planning Department review cycle for this particular project

___ Adjacent owner(s) showing:

- ___ Names (optional).
- ___ Property lines.
- ___ Addresses (optional).
- ___ Tax map numbers.

___ Right-of-Way widths.

___ Existing and proposed with dimensions.

___ Easements, existing and proposed with dimensions.
___ Reference of plat book and page for dedication of additional right-of-way (if available).
___ Existing iron pins from location survey (optional).
___ If on a NCDOT road:
    ___ Reference state road number and street name.
    ___ Reference centerline intersection distance to nearest state road cross street.
___ Beginning and ending stations, including matchline stations for multiple sheets.
___ Easement Notes (see also section on Section 12.0 Standard Notes).
___ Legend for drawing symbols.
___ Drawing symbols to be proportionate.
___ Existing paved roads are to be bored for water and sanitary sewer crossings. Show /label and dimension encasement pipe and carrier pipe.
___ Show all guardrails (include detail). Use standard NCDOT guardrail.
___ Provide the standard utility crossing note on the overall utility plan (See Section 12.0 Standard Notes).

II. Water Mains

___ Existing/proposed water lines shown (sizes, material) and labeled.
___ Dimension and show proposed water main from centerline or right-of-way.
___ Proposed water services installed at right angle to street.
___ Specify the size of blow-off assemblies.

III. Sanitary Sewer Mains

___ Existing/proposed sewer lines shown and labeled.
___ Show angle alignment on outfalls.
___ Dimension proposed manhole from centerline.
___ Station manholes from left to right.
___ For outfalls orient the layout so that the lowest elevation manhole is on the left.
___ Manholes: station and label.
___ Existing manholes with proposed sanitary sewer connections show the following note: Core drill and install flexible rubber boot.
___ Label the manholes as a drop connection or doghouse as appropriate.
___ Show stub-out or knock out for future sewer. Stub outs require a minimum sanitary sewer line length of 5’ (and cap) from the manhole for future sanitary sewer or as directed by the City Engineering Division.
___ Lateral cleanouts shall be located at the easement or right-of-way line.
___ 4" lines should tie into the sewer main with a tap (avoid the manhole) except at cul-de-sacs or as approved by the City Engineering Division.
___ 6" lines and larger must tie into a manhole.
___ Show sanitary sewer services installed at right angles to the street/sewer easement for all lots and buildings.
___ No storm structures or conveyance systems are shown in sanitary sewer easements except as crossing at 90 degrees.
___ Minimum sanitary sewer easement width for sanitary sewer mains is 30’. No combined easements are allowed. Overlapping easements are allowed, so long as any structures or conveyance systems are located outside of the sanitary sewer easement and all easements are labeled separately.

IV. Storm Drainage

___ An overall grading and drainage plan provided showing existing and proposed grading.

___ Storm drainage calculations with hydraulic grade lines and supporting documentation (does not need to be on drawings). See also Section 8.0 Stormwater.

___ Signed and sealed by a registered Professional Engineer if system intercepts stormwater from public streets or offsite drainage.

___ Show all onsite and adjacent storm drainage facilities.

___ Existing drainage shown and labeled including pipes, culverts, manholes, catch basins, ditches, headwalls, endwalls, etc., and appropriate sizes and inverts.

___ Proposed drainage system shown and labeled (numbered) on overall grading and drainage plan.

___ Proposed storm drainage table showing sizes, inverts, grades, lengths, rims, materials, etc.

___ Outlet and Inlet protection (type, size/dimensions, material, etc.).

___ Channel information.

___ Size, typical section, lining, etc. (on the construction drawing).

___ Show and label all storm drainage easements.

___ Floodplain data (fringe line, elevation, floodway, and FEMA panel number).

___ Delineated wetlands.

___ Existing bodies of water (lakes, streams, creeks, etc.) with stream buffers and note (see Section 12 Standard Notes).

___ Show erosion control sediment basin locations. Basins not to be located on or cause storm water to be retained on sanitary sewer easement or public right-of-way.

___ For public streets with 24" pipe or larger include a 4' high PVC coated dark green chain link fence at the right-of-way. Length shall be extended to end of fill section as it intersects existing grade.

___ Flared end sections or headwalls are required at beginning and end of all storm water pipes.

___ Headwalls and endwalls or flared end sections are required on all pipes, however Stormwater Services reserves the right to require headwalls and endwalls instead of flared end sections or vice versa.

___ Minimum stormwater easement width shall be determined per guidelines (Section 8.0). No combined easements are allowed. Overlapping easements are allowed, as long as any structures for other utilities are located outside of the storm water easement and all easements are labeled separately.

V. Street (refer to Section 9.0 Streets for acceptable street types)

___ Provide all street centerline bearings and distances. Provide all centerline radii and length of curves.

___ Provide a typical cross section with pavement thickness.

___ Street names and State Road numbers if applicable.

Existing pavement width (show shaded) dimensioned to back of curb (BOC).

___ Curve data with super elevation, runoff data and design speed.

___ Residential streets are designed without superelevation. If superelevation is desired or needed, submit a sketch to City Engineering indicating why this is needed.

___ Existing and proposed centerlines (if different or new streets are proposed), curb and gutter, edge of pavement, driveways (with widths and material type), sidewalks, handicap ramps, etc. (All center line information shall contain bearing and distance as well as all horizontal curve information).

___ Stations along centerline and at special features (point of tangent, point of curve, catch basins, centerline point of intersection, low/high point, etc.).

___ Taper and lane storage lengths shown. Calculations of lengths to be placed directly on drawings.

___ Obstructions labeled.

___ Posted speed limits for widening of existing streets.

___ Design speed of new streets.
___ Utilities identified and labeled.
___ Trees and shrubs shown and labeled to remain and those to be removed.
___ Street intersection turnouts with radii.
___ Proposed elevations and grades around cul-de-sac and street intersection radii.
___ Street width (back of curb), right-of-way width and all street intersection radii.
___ Signing and Pavement Markings Sheet (when necessary, see Section 10.0 – Transportation).
___ At all road stubs to adjacent properties where required by the Public Works Department, the consultant shall provide all requested future street profiles for review and approval.

SECTION 2.5

CONSTRUCTION DRAWING PROFILE CHECKLIST

Note that plan and profile must be shown on the same sheet and must be shown in the same direction.
Profile drawings are required when:

___ The improvements are to be public.

___ Sewer lines that are to be permitted.

___ Private water lines where they cross the sanitary sewer lines (a cross section is acceptable or dimension if crossing is on the Plan view).

___ Private Streets are proposed.

___ When the City Engineering Division determines that it is required to adequately design the improvements.

A registered Professional Engineer with the State of North Carolina shall prepare the plans (signed and sealed) for improvements to the water mains, sewer mains, street improvements and storm drainage systems and structures. A registered Professional Land Surveyor or Landscape Architect with the State of North Carolina may also be used to prepare street improvements and storm drainage systems and structures (see also Sections 2.4 Plan Checklist, 5.0 Water Supply, 7.0 Sanitary Sewer System, 8.0 Stormwater and 9.0 Streets). *The following is intended as a guide in the preparation and submitting of plans for improvements for water lines, sewer lines, street construction and storm drainage system and structures.* The City Engineering Division's position is one of review and not of detailed checking. Plans found deficient will result in the rejection of the plans and could delay the entire approval process.

I. General

___ Plan view. It is required for all profile drawings (see Section 2.4 Plan Checklist).

___ The plan view is to be at the top and the profile view is to be at the bottom of the sheet (see plan profile sheet at the end of this section for general layout and configuration).

___ For all improvements:

___ Sheet size to be 24" x 36".

___ The scale shall be: 1"=40' horizontally and 1" =4' vertically.

___ Elevations shall be labeled in 10' intervals on the heavy lines (Ex. 360, 370).

___ Existing centerline profile shall be extended adequately to design future extensions (300' preferred).

___ Existing paved roads are to be bored for water and sanitary sewer crossings. Show /label and dimension encasement pipe and carrier pipe and vertical clearance to other pipes crossed.

___ All labels shall be legible and horizontal or vertical. The bottom of all labels shall face toward the bottom of the sheet or the right side of the sheet, whichever is applicable.

II. Water Mains

___ Existing water lines shown with size and type.

___ Proposed water lines shown with size and type.

___ Show minimum cover for proposed underground utilities (3’ minimum or as required by the Engineering Division).

___ Waterlines above sewer lines.

___ Show minimum clearance between utilities:

___ 18" vertical above sanitary sewer lines or 10' horizontal from sanitary sewer line.

___ 12" from storm drainage lines.

___ Waterlines below sanitary sewer lines (sanitary lines shall be ductile iron for 10' on either side of crossing).

III. Sanitary Sewer Mains

___ Existing sanitary sewer lines shown with size and type.

___ Proposed sanitary sewer lines shown with size and type.

___ Show sanitary sewer grades, inverts at manholes, lengths, rims, etc.

___ Show intersecting inverts and label invert elevations.

___ Show centerline of intersecting streets with stations.

___ Check grades and inverts for accuracy.

___ Indicate 100-year flood elevation (reference FEMA panel #, date).

___ Show manhole rims 2 feet above 100 year flood elevation.

___ All manholes not in street right-of-way to be 3.0' above finished grade.

___ Add shading to all ductile iron pipe sanitary sewer lines in profiles to distinguish DIP material from PVC material.

___ DIP used as force mains to be lined with “Protecto 401” or equivalent.

IV. Storm Drainage

___ Submit all drainage calculations (refer to Section 8.0 Stormwater for required drainage calculations).

___ Show existing drainage to remain with inverts, size, etc.

___ Show proposed drainage with inverts, grades, size, length, etc.

___ Maintain a minimum of 1% grade on storm drainage pipes. Further calculations will be required for grades less than 1%, but only with Stormwater Services Approval.

___ Easements required when pipe or channel collects stormwater from a public right-of-way. Easement width to be determined Section 8.0). See Section 12.0 Standard Notes for storm easement note.

V. Street Design

___ Typical section of proposed street if not already shown on plan (refer to Section 9 Streets for acceptable street types).

___ Existing and proposed centerline profile.

___ Existing top of curb profile.

___ Proposed centerline vertical curve information (VPI, VPC, VPT, Elevation, L, DS based on AASHTO and K value). Show TOC elevations at locations not covered by centerline vertical curve information.

___ Proposed grade lines with percent grade shown.

___ Maintain a minimum of 0.7% grade.

___ Existing elevations shown along centerline, right right-of-way and left right-of-way.

___ Profile shall be projected straight down from plan view whenever possible.

___ Show street intersection turnouts in the profile with elevations given at PC, 1/4, 1/2, 3/4, PT.

___ At all road stubs to adjacent properties where required by the Public Works Department, the consultant shall provide all requested future street profiles for review and approval.

View a typical plan profile sheet. It is in PDF format - Acrobat Reader required.

Benchmark
Location
Description
Elevation

NORTH

Tax Map
Number

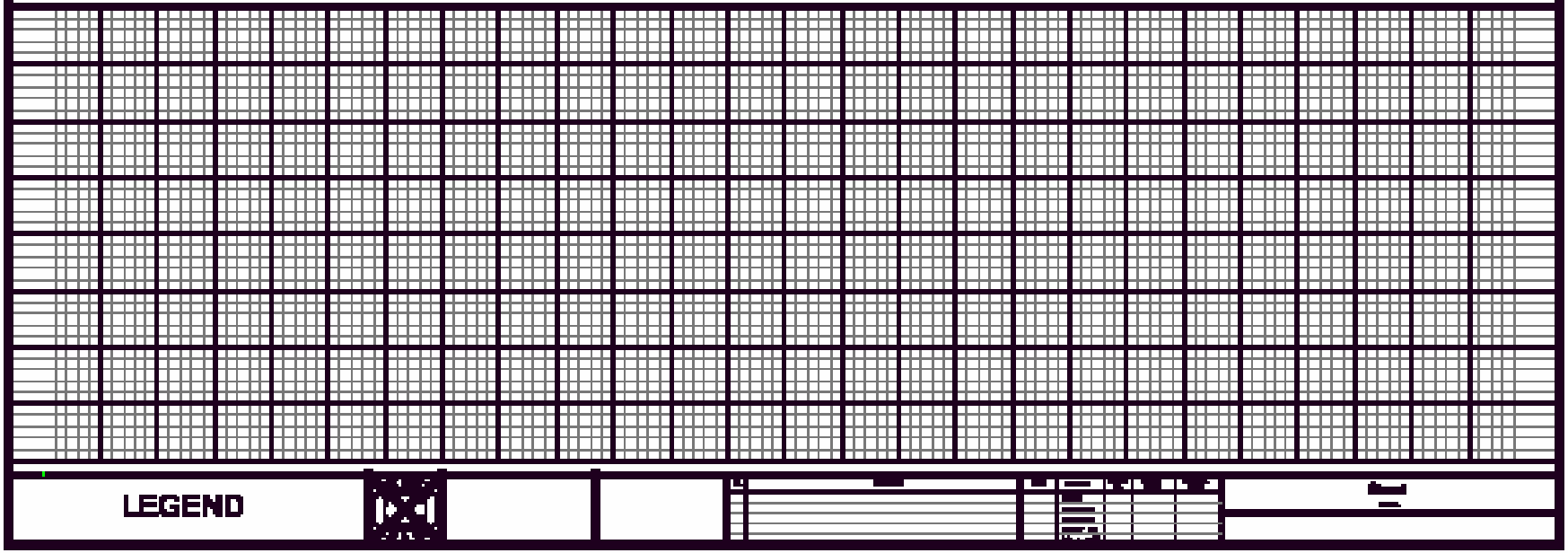
(in upper right hand corner)

Typical Plan Profile Sheet

-For Public Improvements:
1" = 40' Horizontal
1" = 4' Vertical
-For Sanitary Sewer Outfalls, lowest manhole to start at left edge

General Notes
on left side of
sheet

Construction
Approval
Stamp



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SECTION 3.0

PERMITTING

This section is intended to describe the permitting process and which items need to be permitted through the Engineering Division and which may need input from other agencies. The permitting process can start only after the plans have completed the Section 2.1 Construction Plan Approval Process. *For the fee structure, refer to* Section 14.0 Fees.

I. Building Permit

A. Single Family

Contact City/County Building Inspections for a building permit or a building moving permit application and submittal procedure. If the project is a new or revised site plan in Durham City or Durham County the City/County Planning Department should be the first point of contact. The Planning Department will determine if the site requires other type of plan submittals.

B. Multi-family/Commercial Sites

Contact City/County Building Inspections for a building permit application

The Engineering Division will not review the building permit application until:

1. Site has a valid site plan approval.
2. Construction plans (if required) have been submitted to the Engineering Division

II. Moving and Demolition Permits and Information

A. When moving a structure, contact City/County Building Inspections for a Moving Permit Application. This completed form shall be submitted to the Engineering Division, along with a completed Engineering Moving Information Form. (See Section 13 Forms), and other appropriate paperwork. The Moving Permit must be sent to numerous other departments and utilities listed on the application.

B. When demolishing a structure, complete the Engineering Demolition Information Form and submit it with a drawing showing existing conditions. Highlight locations of all utilities. Refer to Section 5.0 Water Supply/Distribution and Section 7.0 Sanitary Sewer System for information regarding abandonment of water service and sewer service, respectively. All services shall be terminated per Section 5.0 and 7.0.

III. Driveway Permits

A. City (Single Family House)

Only for new driveway construction onto a city street. Submit to the City Engineering Division by telephone or by facsimile the street address a minimum of 24 hours before starting construction. The permit can be picked up when the permit fee is paid. The permit is valid if work is to begin within 30 days of being issued.

B. City (Multi-family/Commercial):

1. For previously approved site plans, the permit can be applied for immediately. Bring a copy of the stamped approved site plan indicating Planning Department's sign off. The permit will be issued within 24 hours.
2. For new driveway cuts onto city streets that do not require complete construction drawings (as indicated in the Section 2.2 Construction Plan Submittal Requirements) follow the following approval process:
   a. Submit to Engineering Development Review a copy of a site plan for the proposed driveway for review and approval (allow a maximum of two weeks).
   b. After approval of a site plan, a permit can be applied for at the Public Works Department’s front desk, typical turnaround time is 24 hours..
   c. Contact Engineering Inspections Department 48 hours before starting work to schedule an inspection.

C. State

1. Part of the NCDOT driveway application is securing an approval with signature by the Engineering Division. All NCDOT driveway applications ***must*** be submitted with one copy of a signed, stamped and approved valid site plan by the Durham City/ County Planning Department***. All permits must be completely filled out in order to be signed***. Normal turn-around time for a driveway permit is 24 hours.
2. If the road is state maintained contact the NCDOT office (telephone number listed under Directory) for a permit application.

IV. License Agreements (also known as Encroachment Agreements for State Roads)

A. City

Only for encroachments of private utilities (such as irrigation systems or private communication lines) within the right-of-way of a city street. Refer to the License Agreement Application (a copy of the agreement application is located in Section 13.0 Forms).

B. State

Referred to as Encroachment Agreements and are required for all work located inside the right-of-way of a state maintained road. Contact NCDOT office for a listing of their requirements.

V. Right-of-Way Inspections:

Prior to issuing an occupancy permit by the City/County Building Inspections Department, a right-of-way inspection is required by Engineering Inspection Section. Contact the City Engineering Inspection office.

VI. Sanitary Sewer Permits (NPDES Sewer Extension Permit)

A. General

This section is to include sanitary sewer main extensions (private and public). All sanitary sewer mains plans must have City or County Engineering approval before proceeding with permit application. Refer to Section 2.1 Construction Plan Approval Process and Section 7.0 Sanitary Sewer System for more detail.

No person shall do any of the following things or carry out any of the following activities until or unless they have applied for and have received from the City a permit and complied with such conditions, if any, as are prescribed by such permit:

1. Construct any sanitary sewer system within the city's utility service area if the system is to be connected to the city sanitary sewer system;
2. Alter, extend, or change the construction or method of operation of any sanitary sewer system within the city's utility service area if the system is, or is to be connected to the city sanitary sewer system;
3. Enter into a contract for the construction and installation or the alteration or extension, of any sanitary sewer system that both is within the city's utility service area and is to be connected with the city sanitary sewer system.

B. City (gravity)

The City of Durham Engineering Division has been delegated by the State of North Carolina to permit sanitary sewer lines for the state within the City's collection system. All sanitary sewer lines extending from the City of Durham Sanitary sewer collection system that fit the definition of a collection system, require a sanitary sewer permit before starting sanitary sewer installation. Collection systems shall be as defined by Title 15A of the North Carolina Administrative Code, Subchapter 2H.

If a sanitary sewer permit is required complete the following procedure:

1. Section 2.1 Construction Plan Approval Process.
2. Submit to the Engineering Division:
    a) A complete sanitary sewer permit application (a copy of a permit application is located in Section 13.0 Forms). A separate permit needs to be completed for a private system and a public system.
        i) Owner needs to sign application
        ii) NCPE needs to sign and seal application

b) A check in the amount of $450 made payable to the City of Durham for each permit application. For example, if a project had a public and a private sanitary sewer distribution system, check in the amount of $900 is required (2 permits at $450 each).

c) Appropriate number of City of Durham Engineering Division approved construction documents.

3. Permit applications are generally reviewed within 10 business days of receipt.

C. City (Pump Stations)

For projects using sanitary sewer pump stations, the applicant shall contact the City Engineering Division prior to submittal of site plan or construction plans. This is to determine if the station is to be public or private and what special requirements might be needed. Be advised that this process takes a longer time to complete since the State will need to review and issue the permit.

1. Complete Section 2.1 Construction Plan Approval Process.
2. Submit a complete state pump station permit application, listing the City of Durham as the owner.
3. Submit a check in the amount of $400 made payable to NCDENR.
4. Submit 2 complete sets of approved plans and specifications.

D. County (gravity)

The County of Durham operates a sanitary sewer collection system in the southeast section of the county. For collection systems in this area plans should be submitted simultaneously to the City Engineering Division and the County Engineering Division. Contact City Engineering to confirm jurisdiction. After the plans have been approved, the applicant will forward the plans to the state. Coordinate approvals with the County Engineering Division.

E. County (Pump Stations)

The County of Durham operates a sanitary sewer collection system in the southeast section of the county. For collection systems in this area plans should be submitted simultaneously to the City Engineering Division and the County Engineering Division. Contact Durham Engineering Division to confirm jurisdiction. After the plans have been approved the applicant will forward the plans to the state. Coordinate approvals with the County Engineering Division at (919) 560-7993.

F. County (septic)

Contact the Durham County Health Department for a listing of their requirements

G. Industrial Wastewater Discharge Permit

All industrial users and any other users who discharge wastewater that exceeds the domestic waste concentration as specified in Sec 23-103 of the City's Sanitary Sewer Use Ordinance shall request an industrial user discharge determination from the Industrial Waste Control Section of the Environmental Resources Department.

An Industrial Wastewater Survey and Permit Application package can be obtained by calling the Environmental Resources Department at (919) 560-4381. Based on the information submitted, a determination will be made and a permit will be issued within 180 days from date of completed application. No wastewater discharge is allowed until the Industrial Wastewater Discharge Permit is issued or a determination is made that a permit is not required.

Conditions governing Industrial Wastewater Discharge, permit application process and applicable fees are contained in the City's Sanitary Sewer Use Ordinance and can be obtained from the Environmental Resources Department.

VII. Soil and Erosion Control (Grading) Permit

Contact Durham County Sedimentation and Erosion Control office before doing any land disturbing activity anywhere in Durham County (including inside City) to verify if a permit or a plan is needed. Any disturbance over 12,000 square feet requires a permit and any disturbance over 1 acre requires a plan and a permit.

VIII. Stormwater

A. Drainage Permits for any drainage work that does not require a site plan from the City/County Planning Department pertaining to work on individual properties (channels, pipes, culverts-15" or larger, inlets, etc.) not including Water Quality/Water Quantity Basins.

These plans only have storm drainage improvements.

1. Submit three sets of plans and two sets of calculations to Stormwater Services for approval.
2. The permit can be picked up within 24 hours at the front desk of the Public Works Department upon completion of #1 above.
3. Contact the Engineering Inspections Department 48 hours before starting work to schedule a pre-construction conference.

B. Water Quality/Water Quantity Basins

See Section 8.0 through Section 8.4 for a complete listing of requirements needed for facilities. It is highly recommended this process be started as early as possible. There is a permit fee (listed in Section 14.0 Fees), surety and operation and maintenance agreement required before any construction drawings can be approved.

IX. Water Permits

A. General

Plans must have City Engineering approval before proceeding with permit application. Refer to Section 2.1 Construction Plan Approval Process and Section 5.0 Water Supply for more detail.

No person shall do any of the following activities until or they have applied for and have received from the City a permit and shall have complied with such conditions, if any, as are prescribed by such permit;

1. Construct any water system within the City's utility service area if the system is to be connected to the City water system;
2. Alter, extend, or change the construction or method of operation of any water system within the City's utility service area if the system is, or is to be connected to the City water system; or
3. Enter into a contract for the construction and installation or the alteration or extension, of any water system that both is within the City's utility service area and is to be connected to the City water system.

B. City

The City of Durham Engineering Division has been delegated by the State of North Carolina to permit waterlines for the state within the City's distribution system. *The following waterlines will need a permit:*

1. Public or private waterline distribution systems as defined by NCDENR.
2. All fire lines;
    a. That have taps on them outside of the building, or
    b. That have fire hydrants
3. Lines that the City Engineering Division determines require a permit.

If a permit is required:

1. Complete Section 2.1 Construction Plan Approval Process
2. Submit to the Engineering Division;

a) Complete water permit application (a copy of a permit application is located in the section entitled Section 13 Forms). A separate permit needs to be completed for a private system and a public system.
    i) Owner needs to sign application
    ii) NCPE needs to sign and seal application

b) A check in the amount of $300 made payable to the City of Durham for each permit application. For example, if a project had a public and a private water distribution system, 1 checks in the amount of $600 is required (2 permits at $300 each).

c) Three (3) sets of approved plans by the City of Durham Engineering Division.

3. Permit applications are generally reviewed within 10 business days of receipt.

C. State

Required for all private waterline distribution systems with wells. Contact North Carolina Department of Environmental Health and Natural Resources for a listing of their requirements and/or the Durham County Health Department.

D. Cross-Connection

Refer also to the Section 6.0 Cross Connection Control. Contact Environmental Resources-Cross Connection Control for permit application. Cross connection permits are required for back-flow preventers which are required on all waterlines that are:

1. Greater than 50' of dead end line
2. Fire lines
3. Irrigation lines
4. Lines as required by Cross-Connection.

X. Wetlands

Contact the U.S. Army Corps of Engineers if there is any possibility of wetlands on the site before starting any land planning. All wetlands are to be mapped and plans approved by the Corps of Engineers. An area is generally considered as potential wetlands if the site has floodplain, creeks (dry or wet weather), ponds or meets certain other criteria of the Corps of Engineers. Wetland mitigation plans may also be required. Note that it is the responsibility of the applicant to contact the U.S. Army Corps of Engineers and this should be done early in the planning process.

XI. Utility Mainline Construction Permits

This permit type shall be applied for by all utility companies that possess a franchise agreement to operate within the City of Durham limits and wish to install their utilities within the existing or proposed public right-of-way of a development. Permits will be required when:

A. The proposed development is located within the current City limits and the proposed utility is to be placed within the public right-of-way and/or easement.

B. The proposed development is located outside the current City limits, but an annexation petition is being pursued.

Utility companies must submit letters of application and plan drawings to the City Engineering Division. Permits must be issued prior to the start of work.

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SECTION 4.0

AS-BUILT DRAWINGS

As-built drawings shall include plans that were approved under Section 2.1 Construction Plan Approval Process. As-built drawings are required for:

1. Public water mains, sanitary sewer systems, street improvements, stormwater quality/quantity basins and storm systems (including open drainage and all pipes 15 inches or larger).
2. As needed for individual permits issued if the permits require as-builts.

If as-built drawings are required, use the following procedure:

1. Submit three (3) sets of prints to the Public Works Department/Engineering Division for review, modified as follows:
   - a) Correct the drawings to the as-built condition. The corrections must be legible.
   - b) Remove "Proposed" from all locations.
   - c) Horizontal distances should scale within five (5) feet. Vertical distances should scale within six (6) inches. Redraw items to correct locations, if actual location differs by more than this.
   - d) All installed pipe sizes, pipe materials and pipe locations shall be indicated (inverts or top elevations).
   - e) On the plan view, water connections shall be shown by dashed lines and sanitary sewer connections by solid lines.
   - f) Water meter and sanitary sewer service cleanout locations referenced to the nearest property lines to the nearest 0.1 feet.
   - g) If water-only project, connections should be located by station from nearest mainline valve or hydrant valve (Ex. WM 2+00). 0+00 shall be labeled at the valve where stationing begins with an arrow indicating the direction that stations run. Stations should generally run in the same direction for each street.
   - h) If sanitary sewer-only or water and sanitary sewer project, services should be located with distance from property corner or from station from nearest downstream manhole (Ex: W S 1+80).
   - i) On the plan view, show distances between all water line valves, tees, bends, etc. (EX: 500' valve to tee).
   - j) Water mains shall have a separate detail sketch on the plan view above all intersecting water mains and fire hydrants showing as-built distances between valves, hydrants, crosses, tees, etc.
   - k) Show as-built stations for all sanitary sewer and storm drainage manhole on plan view and profile view (Ex: MH Sta. 3+01.59).
   - l) Plan view for sanitary sewer and storm drainage shall have as-built manhole-to-manhole distances (Ex: 301.59 MH to MH). Distances shall be measured in the field from center of manhole cover to center of manhole cover.
   - m) Profile view shall have as-built manhole rim elevations for sanitary sewer outfalls (Ex: RIM 810.10).
   - n) Profile view shall have as-built elevation for the all inverts for all sanitary sewer and storm drainage manholes (Ex: C/L MH INV 800.10). Elevations shall be shown for the invert at the top of the drop pipe for an outside drop manhole and for the vent pipe on a Type B manhole.
   - o) As-built MH-to-MH distances and invert elevations shall be used to compute as-built grades. Grades shall be carried out to two decimal places (Ex: 5.06%).
   - p) Major horizontal alignment changes shall be indicated on the plan view. For sanitary sewer, survey parties need to turn angles for major changes only. All sanitary sewer outfall sections shall have bearings, distances, and easements noted.

q) Show as-built grades, inverts, rim elevations and locations of all storm drainage structures (storm lines, catch basins, yard inlets, culverts, etc).

r) Any horizontal or vertical changes in the street alignment or profile shall be shown if:

1) The design speed is affected.

2) The horizontal or vertical change is greater than 0.5 foot.

3) Stormwater direction of flow is effected from original approved plans

s) Street names, lot numbers (as referenced on plat), right-of-way and street widths, etc. shall be labeled in plan view.

t) Remove all notes pertaining to copy write infringements and preventing photo copies of drawings.

2. After these plans have been reviewed and approved provide one set of reproducibles (5 mm thick) double mat mylar with corrections along with marked-up set if applicable. An electronic copy of the plan is also required in *.dxf format submitted on a compact disc. As-built certification must be signed and sealed by a North Carolina Professional Engineer or a Professional Land Surveyor.

As-built certification statement in the form of:

AS-BUILT CERTIFICATION:
To the best of my knowledge and belief and based
upon information provided by the Contractor, Field Inspector, or Surveyor or a field inspection performed by myself, the data shown on this drawing is as constructed in the field.
_____ *Date* _____

SECTION 4.1

STORMWATER WET DETENTION POND AS-BUILT DRAWINGS

As-built drawings shall include plans that were approved under Section 2.1 Construction Plan Approval Process.

Use the following procedure for submitting as-built drawings:

1. Submit two (2) sets of 24" X 36" as-built prints to the Public Works Department/Stormwater Services Division for review with the following items included on the plan sheets:
   a) Provide as-built grades, inverts, sizes, materials, rim elevations and locations of all storm drainage structures (risers, outlet pipes, weirs/spillways, etc), details of the trash rack/surface baffle/or similar device; all elevations shall be actual elevations, not relative elevations.
   b) Provide pond bottom elevation with associated area in ft^2.
   c) Provide inside aquatic bench elevation with pond area in ft^2 and the width of the bench.
   d) Provide outside aquatic bench elevation with pond area in ft^2.
   e) Provide the water surface area at the elevation of the normal pool in ft^2.
   f) Provide top of pond elevation with associated pond area in ft^2 and embankment top width.
   g) Provide all side slopes (H:V) for pond embankments.
   h) Provide a plan view of the pond showing the constructed grading.
   i) Provide the volume of the forebay.
   j) Provide a profile through the forebay, main pond and spillway with elevations.
   k) If the elevations of the outlet structures or sizes of the outlet structures differ from the approved construction drawings, a revised routing analysis shall be provided on 8.5" X 11" sheets, based upon the surveyed information at 1.00 foot increments.
   l) If the surveyed pond volumes are less than the approved construction drawings, a revised routing analysis shall be provided submitted on 8.5" X 11" sheets, based upon the surveyed surface areas at 1.00 foot increments.
2. After these plans have been reviewed and approved provide one set of reproducibles (5 mm thick) double mat mylar with corrections along with marked-up set if applicable. An electronic copy of the plan is also required in *.dxf format submitted on a compact disc. As-built certification must be signed and sealed by a North Carolina Registered Professional.

   As-built certification statement in the form of:

   AS-BUILT CERTIFICATION:
   To the best of my knowledge and belief and based
   upon information provided by the Contractor, Field Inspector, or Surveyor and a field inspection performed by myself, the data shown on this drawing is as constructed in the field.
   _____ *Date* _____

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SECTION 4.2

STORMWATER SAND FILTER AS-BUILT DRAWINGS

As-built drawings shall include plans that were approved under Section 2.1 Construction Plan Approval Process.

Use the following procedure for submitting as-built drawings:

1. Submit two (2) sets of 24" X 36" as-built prints to the Public Works Department/Stormwater Services Division for review with the following items included on the plan sheets:
   a) Provide as-built grades, inverts, sizes, materials, rim elevations and locations of all storm drainage structures (risers, outlet pipes, weirs/spillways, etc), details of the trash rack/surface baffle/or similar device; all elevations shall be actual elevations, not relative elevations.
   b) Provide bottom elevation of sediment chamber with surface area in ft^2.
   c) Provide the overflow weir invert elevation to sand bed.
   d) Provide the volume of the sediment chamber to the overflow weir invert elevation.
   e) Provide bottom elevation of bottom of sand bed with surface area in ft^2.
   f) Provide the elevation at the top of the sand bed with surface area in ft^2.
   g) Provide the side slopes (H:V) for the sediment chamber and sand chamber.
   h) Provide the top elevation of the sediment chamber and sand chamber with surface areas in ft^2.
   i) Provide a profile through the sediment chamber, sand chamber and spillway with elevations.
   k) Provide a plan view of the sediment chamber and sand chamber showing the constructed grading.
   l) If the elevations of the outlet structures or sizes of the outlet structures differ from the approved construction drawings, a revised routing analysis shall be provided submitted on 8.5" X 11" sheets. Provide actual stage/discharge rating curves and tables on 8.5" X 11" sheets based on the surveyed information at 0.50 foot increments.
   m) If the surveyed pond volumes are less than the approved construction drawings, a revised routing analysis shall be provided submitted on 8.5" X 11" sheets. Provide actual stage/storage rating curves and tables on 8.5" X 11" sheets based on the surveyed data at 0.50 foot increments.
2. After these plans have been reviewed and approved provide one set of reproducibles (5 mm thick) double mat mylar with corrections along with marked-up set if applicable. An electronic copy of the plan is also required in *.dxf format submitted on a compact disc. As-built certification must be signed and sealed by a North Carolina Registered Professional.

   As-built certification statement in the form of:

   AS-BUILT CERTIFICATION:
   To the best of my knowledge and belief and based
   upon information provided by the Contractor, Field Inspector, or Surveyor and a field inspection performed by myself, the data shown on this drawing is as constructed in the field.
   _____ *Date* _____

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SECTION 4.3

STORMWATER DRY DETENTION POND AS-BUILT DRAWINGS

As-built drawings shall include plans that were approved under Section 2.1 Construction Plan Approval Process.

Use the following procedure for submitting as-built drawings:

1. Submit two (2) sets of 24" X 36" as-built prints to the Public Works Department/Stormwater Services Division for review with the following items included on the plan sheets:
   a) Provide as-built grades, inverts, sizes, materials, rim elevations and locations of all storm drainage structures (risers, outlet pipes, weirs/spillways, etc), details of the trash rack/surface baffle/or similar device; all elevations shall be actual elevations, not relative elevations.
   b) Provide pond bottom elevation with associated area in ft^2.
   c) Provide top of pond elevation with associated pond area in ft^2 and embankment top width.
   d) Provide all side slopes (H:V) for pond embankments.
   e) Provide a plan view of the pond showing the constructed grading.
   f) Provide a profile through the main pond and spillway with elevations.
   g) If the elevations of the outlet structures or sizes of the outlet structures differ from the approved construction drawings, a revised routing analysis shall be provided on 8.5" X 11" sheets, based upon the surveyed information at 1.00 foot increments.
   h) If the surveyed pond volumes are less than the approved construction drawings, a revised routing analysis shall be provided submitted on 8.5" X 11" sheets, based upon the surveyed surface areas at 1.00 foot increments.
2. After these plans have been reviewed and approved provide one set of reproducibles (5 mm thick) double mat mylar with corrections along with marked-up set if applicable. An electronic copy of the plan is also required in *.dxf format submitted on a compact disc. As-built certification must be signed and sealed by a North Carolina Registered Professional.

   As-built certification statement in the form of:

   AS-BUILT CERTIFICATION:
   To the best of my knowledge and belief and based
   upon information provided by the Contractor, Field Inspector, or Surveyor and a field inspection performed by myself, the data shown on this drawing is as constructed in the field.
   _____ *Date* _____

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SECTION 4.4

STORMWATER BIORETENTION AS-BUILT DRAWINGS

As-built drawings shall include plans that were approved under Section 2.1 Construction Plan Approval Process.

Use the following procedure for submitting as-built drawings:

1. Submit two (2) sets of 24" X 36" as-built prints to the Public Works Department/Stormwater Services Division for review with the following items included on the plan sheets:
   a) Provide as-built grades, inverts, sizes, materials, rim elevations and locations of all storm drainage structures (risers, outlet pipes, weirs/spillways, etc), details of the trash rack/surface baffle/or similar device; all elevations shall be actual elevations, not relative elevations.
   b) Provide width and slope of grass buffer strip upstream of bioretention cell.
   b) Provide surface area in ft^2 of the bioretention cell.
   c) Provide the length and width of the bioretention cell.
   d) Provide the elevation of the top of the mulch layer.
   e) Provide the elevation of the top of the planting soil layer.
   f) Provide the elevation of the top of the sand layer if applicable.
   g) Provide the elevation of the top of the gravel jacket.
   g) Provide the elevation of the bottom of the bioretention cell.
   h) Provide the spacing between the perforated pipe runs.
   i) Provide a profile through the bioretention cell and outlet structure with elevations.
   k) Provide a plan view of the bioretention cell showing the constructed grading.
   l) If the elevations of the outlet structures or sizes of the outlet structures differ from the approved construction drawings, a revised routing analysis shall be provided submitted on 8.5" X 11" sheets. Provide actual stage/discharge rating curves and tables on 8.5" X 11" sheets based on the surveyed information at 0.50 foot increments.
   m) If the surveyed pond volumes are less than the approved construction drawings, a revised routing analysis shall be provided submitted on 8.5" X 11" sheets. Provide actual stage/storage rating curves and tables on 8.5" X 11" sheets based on the surveyed data at 0.50 foot increments.
2. After these plans have been reviewed and approved provide one set of reproducibles (5 mm thick) double mat mylar with corrections along with marked-up set if applicable An electronic copy of the plan is also required in *.dxf format submitted on a compact disc. As-built certification must be signed and sealed by a North Carolina Registered Professional.

   As-built certification statement in the form of:

   AS-BUILT CERTIFICATION:
   To the best of my knowledge and belief and based
   upon information provided by the Contractor, Field Inspector, or Surveyor and a field inspection performed by myself, the data shown on this drawing is as constructed in the field.
   _____ *Date* _____

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SECTION 5.0

WATER SUPPLY/DISTRIBUTION

I. General

This section provides guidelines for the design of water main extensions for the City of Durham water distribution system. As a minimum, the Developer/Engineer shall satisfy the requirements contained herein and the City of Durham Construction and Specification Standards. See also Section 2.1 Construction Plan Approval Process.

II. Sizing Of Water Mains

A. Source

If the proposed development has 100 or more dwellings the site shall have no less than two public water main feeds serving the site. Existing mains greater than 16" in diameter are considered transmission mains and no connection of any kind to these mains is allowed. Developers must use mains 16" diameter and less as the source location.

B. Size

1. The size of the water lines are determined by:
   a) Fire flow plus domestic demand for the site (see also C. Pressure).
   b) Future growth beyond the site.
   c) Engineering Division.
2. The standard pipe diameter for public and private lines are 4", 6", 8", 12", 16" (refer to the City of Durham Water and Sewer Specifications). In addition, 10" diameters may be used for private lines.

C. Pressure

Water mains shall be sized to provide a minimum system pressure of 20 psi during peak system demands plus fire demand. In certain areas of Durham, or for multi-story buildings, there is a potential for having lower water pressure and a private booster pump may be needed to assure adequate service to the site. If it is determined that the proposed development has a potential of being in one of these lower pressure areas, complete and submit the "Potential Low Water Pressure Acknowledgement" in Section 13.0 Forms as directed by the City of Durham Engineering Division. If higher pressures are required or desired, it is the responsibility of the water customer to provide the necessary booster pumping equipment and facilities. If booster pumps are used contact the Engineering Division and cross-connection control for requirements (back-flow, etc.). The booster pumps should be clearly noted on the construction plans if they are proposed. The peak system demands are to include:

1. The peak domestic demand plus
2. The Fire Protection System (sprinkler) demand plus
3. The fire flow demand shall be the demand for any hydrant on the project. A minimum residual pressure of 20 psi shall be available at all points in the distribution system during peak system demands. The project types and demands shall be as follows:

a) Single family residential	1,500 gpm
b) Office; hotels with sprinklers; institutional; townhomes; multifamily; or apartment buildings (24 units or less)	2,000 gpm
c) Commercial with sprinklers; hotels without sprinklers; large scale multifamily apartment buildings (greater than 24 units in building)	2,500 gpm
d) Commercial without sprinklers	3,000 gpm
e) Industrial with sprinklers	3,000 gpm

f) Industrial without sprinklers 3,500 gpm

g) AWWA M31 "Distribution System Requirements for Fire Protection" (Collection of fire protection methods for determining peak fire flow demands).

For projects designed with more than one phase, pressure shall be checked so that these guidelines are satisfied during each phase of construction as well as after final completion of all phases.

For projects that are designed with multiple uses, the fire flow selected shall be based on the highest use allowed by zoning (i.e. – a use is set up as an office building but the zoning would allow a commercial or retail occupant to occupy the building then the requirement would be to satisfy the ultimate use of a commercial or retail occupant).

D. Fire Flow Report Requirements

If a hydrant is proposed on a project a fire flow analysis report is required to be approved by the City of Durham Engineering Division. The Engineer shall be responsible for contacting the City of Durham Engineering Division to determine the water system characteristics in the vicinity of the project. See Fire Flow Test Application in Section 13.0 Forms. The City will provide fire flow information in the vicinity of the proposed development. The Developer/Engineer shall submit information on the required fire flow and calculations in accordance with the submittals section to confirm the required fire flow is available. The fire flow analysis shall include the following:

a) Cover sheet with project name, property identification number and PE seal and signature

b) Summary Report should include the following:
   1) Location of pressure hydrant in relation to the site.
   2) Statement of required fire flow for the project. Briefly describe the project and indicate current zoning of the parcel.
   3) Statement of the following: " The (name of project) project with (required fire flow) gpm fire flow, (required peak domestic demand) gpm peak domestic flow and (sprinkler flow demand from sprinkler designer) gpm sprinkler flow provides (lowest residual pressure in system) psi residual flow at the critical node (lowest residual pressure system node). This (meets)/(does not meet) the City of Durham fire flow requirements.

c) Schematic drawing with pipe system layout referencing nodes and pipes. Map (to scale) of location of test hydrant (pressure) and the location of the site clearly indicated.

d) List original water system characteristics as provided by the City noting date, location, flow hydrant, pressure hydrant and Q20 flow available.

e) Pipe and node report indicating pipe sizes, lengths, frictions factor, minor losses and appropriate elevations and demands. Provide all references for minor loss factors and if a range is given state the value you are using. (Use C=120 for new pipes and C=110 for existing pipes)

f) Static condition indicating only new domestic demand. (Provide all references and calculations for domestic peak demands)

g) Separate fire flow models from each hydrant to indicate each hydrant is capable of providing the fire flow demand while concurrently providing peak domestic and fire protection system demand.

If the fire flow analysis does not meet the minimum City of Durham requirements then the consultant shall contact the City of Durham Engineering Division for further instruction, which may include additional offsite/onsite improvements.

NOTE: At the successful completion of the waterline testing phase the City of Durham Engineering Division may elect to flow test some of the hydrants to obtain data to compare against the fire flow analysis. If the flow data is inconsistent with the analysis, the design consultant and developer will be contacted to remedy the situation.

E. Water Main Material

All waterlines shall be ductile iron and services to be copper to the water meter or to the property line (meeting AWWA standards).

III. Water Main Location

A. Depth

1. Water mains shall be designed with a minimum of three feet of cover or as directed by the Engineering Division from the top of the ground to the crown of the pipe.
2. For proposed waterlines along existing roads, road centerline or edge of pavement will be required on profile in addition to the top of ground above the waterline (Cross-sections of the road from centerline of roadway to right-of-way will be required at 100' intervals in addition to waterline profiles). Additional cross-sections may be required depending on the project. Over long distances (greater than 1000') the number of cross-sections may be reduced with the City of Durham Engineering Division approval.

B. Location

Water mains are normally located:

1. Under pavement unless approved by City Engineering
2. On the north and east sides of streets.
3. Additional waterline stubs can be required at the discretion of the City of Durham Engineering Division. At a minimum, additional stubs will be required at all intersecting roadways or rights-of - way (locations to be determined by the Engineering Division).
4. 10 feet from centerline of street (not to be under the curb and gutter section).
5. Shall be 18" above or 10' horizontal from sanitary sewer lines. If unable to maintain either of these separations both lines shall be made of ductile iron for a minimum of 10' beyond the crossing with the joint being centered at the point of intersection.
6. Shall be 12" separation from storm sewer lines and other utilities.

C. Easements, Encasements and Rights-of-Way

1. All public water mains shall be located within a street right-of-way to allow City personnel access to the main for maintenance and repair. Public water mains in easements are the exception and require special approval for use.
2. Public water main easements shall be no less than 25 feet and may be greater depending upon depth and location.
3. Private water main easements shall be no less than 25 feet and may be greater depending upon depth and location.
4. Private water lateral easements shall be no less than 15 feet and may be greater.
5. No landscaping or earthwork is allowed in existing waterline easements. No landscaping is allowed in proposed waterline easements and all earthwork must be completed before waterline is installed.
6. Encasements are required for bored crossings and railroad ROW. Refer to the City of Durham Water and Sewer Construction Specifications for pipe encasement details. See the table below for encasement sizes. NCDOT and the railroads may have more stringent requirements.

Sizing Table for Carrier Pipes and Casing Pipes				
Nominal Carrier Pipe Size (Inches)	Steel Casing Pipe Size (Inches)			
	Railroad Crossing		Road Crossing	
	Outside Diameter	Wall Thickness	Outside Diameter	Wall Thickness
3 and Under	12.75	0.188	6.625	0.250
4	12.75	0.188	8.625	0.250
6	12.75	0.188	12.75	0.250
8	16	0.219	16	0.250
10	20	0.281	20	0.250
12	24	0.312	24	0.250
14	28	0.375	28	0.312
16	30	0.406	30	0.312
18	36	0.469	36	0.375
20	42	0.562	42	0.500
24	42	0.562	42	0.500

IV. Fire Hydrants

1. The spacing and location of fire hydrants shall meet the current provisions of the North Carolina Fire Prevention Code in addition to those provisions set forth in Items 2 through 16 below. Adequate spacing of fire hydrants shall be determined by the Fire Official. Spacing of fire hydrants around buildings and facilities shall take into account natural and man-made barriers, including steep terrain, walls, fences, waterways, culverts and vehicle parking areas. Distance measurements shall be made along the centerline of fire equipment access roadways where roadways occur.
2. Fire hydrants shall be located so that they shall be installed on a 6-inch branch line and shall be equipped with a gate valve for isolation purposes. The hydrant isolation valve shall be located directly adjacent to the water main and shall be inside the pavement when possible.
3. Hydrants shall be oriented so that large diameter connection faces fire apparatus access.
4. Hydrants shall be no closer than 10 feet from the PC or PT of any intersection, including driveways.
5. Hydrants are to be placed 18 inches to back of curb.
6. Hydrants are 1 foot within the right-of-way on strip paved streets.
7. In residential and multi-family areas:
    a) Fire hydrants shall be located near each street intersection.
    b) Maximum spacing of hydrants in single-family housing areas shall not exceed 500 feet. The hydrant spacing distance shall be the horizontal distance as measured along the centerline of the street.
    c) Hydrants shall be located near the entrance of each cul-de-sac bulb where the street leading to the bulb is greater than 500 feet in length from the street centerline to the cul-de-sac radius point.
    d) Hydrants should be on same side as all Fire Department Connections.
8. In all commercial, business, institutional, office, shopping center, mobile home, and industrial areas:
    a) Fire hydrants shall be located at each street intersection.
    b) Maximum spacing between hydrants shall not exceed 500 feet. The hydrant spacing distance shall be the horizontal distance as measured along the centerline of the street.
9. For projects designed with more than one phase, hydrants shall be located so that these guidelines are satisfied during each phase of construction as well as after final completion of all phases.
10. Hydrants shall be situated at locations which enable fire apparatus to pass other fire apparatus which have stopped to connect to the hydrant (driveway width 20 foot minimum)
11. A hydrant shall be installed no less than 6 feet nor more than 50 feet (lineal) from any and all Fire Department Connections (FDC).
12. Landscape plantings (when fully grown) or other vertical projections greater than 6 inches in height shall not encroach upon any fire hydrant within a 3 foot radius and not obscure view of hydrant upon approach.
13. Hydrants should be located a minimum of 40 feet from any building walls.

14. Hydrants shall be situated to enable fire equipment to first pass a fire hydrant before reaching any structure or hazard associated with a site.
15. Fire hydrants located on private property adjacent to a site may be considered when an off-street access roadway of sufficient width and height between the two sites is established by an easement and approved by the Fire Official.
16. Fire Hydrants located –
    a) Across streets or roadways with median dividers, or
    b) Across streets or roadways with 4 or more lanes, or
    c) Across streets or roadways with an average daily traffic count of more than 30,000 vehicles.

    From a site shall not be considered accessible and useable for purposes of this section.

V. Fire Department Connections (FDC)

A. These fittings, typically associated with a sprinkler/standpipe system within a building, shall be located no closer than 6 feet nor greater than 50 lineal feet of a fire hydrant. Both hydrant and connection shall be accessible along the roadway fronting the building or along the roadway approaching the building. The location is subject to approval by the Fire Official.

B. Contact Fire Department for requirements for buildings with standpipe systems.

VI. Valves

Only City personal are permitted to operate public water main valves unless other arrangements have been pre-approved by the City Engineering Division.

A. Type

1. Valves 8 inch and below require a valve box.
2. Valves 12 inch and 16 inch are required to be in 4 foot diameter manholes.
3. Gate valves are to be used up to and including 16 inch diameter water lines.
4. Valves controlling fire protection system water supplies, where located on private property shall be in accordance with the North Carolina Fire Prevention Code. Post indicator valves (PIV), located 40 feet from building walls when possible, shall be installed unless other valve arrangements are approved by the Fire Official.

B. Locations

1. Each intersection of water mains shall have one less main line valve than the number of intersecting pipes.
2. For all private water systems, the valves shall be located at the right-of-way line to denote public and private maintenance responsibilities.

C. Straight Runs

Main line valves located in straight runs of pipe shall be spaced as follows:

Main Size	Maximum Spacing
4 inch	400 feet
6 inch	600 feet
8 inch	900 feet
12 inch	1000 feet
16 inch	1000 feet

D. Tapping Sleeves

1. A City of Durham Engineering Division Inspector is to be present at all taps to water mains prior to the tap being made unless other arrangements have been made with the City Inspector.
2. Wet tap with a tapping sleeve and valve is permitted (refer to the City of Durham Water and Sewer Standards and Specifications).
3. Same size taps are only allowed on an 8 inch line and smaller. Any larger same size connection requires installing a tee and valve(s).

4. If a tapping valve is 12 inch or larger, the valve and the tapping sleeve are to be located within one manhole. Cut in tees with sleeves are required for 12 inch X 12 inch same size taps or larger.

E. Terminating Lines

1. For 12 inch by 16 inch taps the valve and tapping sleeve are to be located in a 5 foot diameter manhole.
2. Piping 12 inch and greater shall extend 3 pipe joints beyond end line valve.

VII. Blow-offs

Blow-offs shall be installed on all dead end mains and, as directed by the Engineering Division, at elevated points along the water main. A 1-inch blow-off assembly shall be installed on all dead end mains 8-inch or less in diameter, and a 2-inch blow-off assembly shall be installed on all dead end mains greater than 8-inches in diameter. Fire hydrants are not considered as blow-offs for public lines.

VIII. Pressure-Reducing Valves

Pressure-reducing valves for water services shall be installed in accordance with current City of Durham Plumbing Code.

IX. Services and Meters

1. Two meters shall not share one service line unless one meter is for irrigation purposes. Each domestic meter shall have its own service line from the main.
2. Water meters shall be accessible to city personal at all times.
3. Water line services shall be copper or ductile iron from the main to the water meter and property line.
4. Water services shall be at right angles from the centerline of the street.
5. Meters locations shall be:
   a) At the ROW line.
   b) Just inside the ROW line. If sidewalk is located at the right-of-way line then the meter shall be installed at the back of sidewalk or can be installed in the sidewalk providing the water meter box top is flush, smooth and is not a tripping hazard. Extreme care must be taken to avoid hindering the accessibility of the meter with sidewalk construction. Avoid getting concrete in or on any part of the meter box.
   c) Easy to access with a vehicle (so a truck could back up to the meter).
   d) Located in non-heavily landscaped areas
6. Meters equal to or greater than 1 1/2" shall be located in a vault with a 4" PVC gravity drain to daylight or drainage structure. Meters less than 1 1/2" shall be located in a meter box.
7. Sites with city sewer that are served by wells need a city water meter installed at an accessible place for the meter reader.
8. Maximum tap sizes, allowed without a saddle, for various classes of ductile iron pipe:

Pipe Diameter (inches)	Maximum Tap Size for Class 250/350 Pipe (inches)
4	3/4
6	3/4
8	1
10	1 1/4
12	1 1/2

16" and larger see City Engineering for prior approval before tapping. Taps larger than those listed must utilize a saddle or approved tapping sleeve.

X. Water System Abandonment

A. Water Services

1. Abandonment of water services shall include excavating down to corporation, turning it off and cutting service line free from corporation. The meter, if present, shall be returned to City of Durham.

SECTION 6.0

CROSS CONNECTION CONTROL

This section is intended to provide design criteria for when a backflow preventer is required. The Environmental Resources-Cross Connection Control office is responsible for reviewing the type of prevention assembly specified and issuing a permit. Contact Cross Connection Control at (919) 560-4194. Submit plans to City Engineering according to Section 2.1 Construction Plan Approval Process.

These guidelines are supplemental to Section .1006 (b) of the "Rules Governing Public Water Supplies". These guidelines are intended as a minimum requirement. Public water suppliers may adopt more stringent requirements. Each supplier of water shall conform to the minimum requirements established in these guidelines. **All backflow preventers located in vaults require a 4" PVC gravity drain to daylight or to drainage structures. No water line shall create greater than 50 feet of dead water without a backflow preventer device being installed.**

I. Degree of Hazard:

A. Severe: Actual or potential threat of contamination that presents an imminent danger to the public health with consequence of serious illness or death.

B. Moderate: One that presents foreseeable and significant potential for pollution, nuisance, aesthetically objectionable or other undesirable alterations of the drinking water supply.

II. Backflow Prevention Assembly Requirements:

A. Degree of Hazard:

	RPZ/RPDA	DCVA/DCDA	Air Gap
Severe	Yes	No	Yes
Moderate	No	Yes	No

RPZ=Reduced pressure zone

RPDA=Reduced pressure detector assembly

DCVA=Double check valve assembly

DCDA=Double check detector assembly

III. Guidelines for Assembly Installation in Water Distribution Systems

A. RPZ/RPDA:

1. Above ground installation.
2. Twelve (12) inches minimum clearance from vault walls and floors.

B. DCVA/DCDA:

1. Above ground installation preferred.
2. Adequate gravity drainage to daylight (no structure) shall be provided if installed below ground.

C. RPZ /DCVA a backflow prevention assemblies shall be installed in the horizontal position.

D. RPDA/ DCDA water meters must read in cubic feet.

IV. Facilities that Require Installation of a Backflow Preventer (this is not intended to be an exhaustive list):

A. Moderate hazard - DCVA or DCDA:

1. Fire sprinkler systems without booster pump facilities or chemical additives.
2. Connection to tanks, lines and vessels that handle non-toxic substances.
3. Lawn sprinkler systems without chemical injection or booster pumps.
4. Most commercial establishments

5. Automotive service stations, bakeries and beauty shops with no health hazard and bottling plants with no backpressure.

6. Etc.

B. Severe hazard - RPZ, RPDA or air gap:

1. Lawn sprinkler systems with chemical injection or booster pump

2. Wastewater treatment plants

3. Connection to an unapproved water system or unapproved auxiliary water supply

4. Connection to tanks, pumps, lines, steam boilers and vessels that handle sewage, lethal substances, toxic or radioactive substances

5. Fire sprinkler systems with booster pump facilities or chemical additives or installation for buildings with five or more stories above ground level.

6. Domestic water services for buildings with five or more stories above ground level

7. Hospitals and other medical facilities

8. Morgues, mortuaries and autopsy facilities

9. Metal plating facilities

10. Bottling plants (subject to back pressure)

11. Canneries

12. Battery manufactures

13. Exterminators and lawn care companies

14. Chemical processing plants

15. Dairies

16. Film laboratories

17. Car wash facilities

18. Dye works

19. Laundries

20. Swimming pools

21. Water front facilities

22. Etc.

V. Approved Backflow Prevention Assemblies:

Meets ASSE standard and carries ASSE seal or is on the University of Southern California approval list.

VI. Backflow Prevention Assembly Installation:

Backflow prevention assemblies must be located in a place where it is readily accessible for regular testing, maintenance and inspection. Bypass lines parallel to a backflow prevention assembly shall have an approved backflow prevention assembly installed that is equal to that on the main line.

SECTION 7.0

SANITARY SEWER SYSTEM

I. General

This section provides minimum guidelines for the design of sanitary sewer main extensions for the City of Durham sanitary sewer collection system. The Developer/Engineer shall satisfy the requirements contained herein. See also Section 2.1 Construction Plan Approval Process and the City of Durham Water and Sanitary Sewer Construction Specifications.

II. Sizing Of Sanitary Sewer Mains

A. Pipe diameter

1. The size of the sanitary sewer lines are determined by:
   a) NCDENR sizing requirements for sanitary sewer collection systems
   b) Future growth beyond the site.
   c) Engineering Division.
2. The standard pipe diameter for public lines are 8 inch, 10 inch, 12 inch, 15 inch, 18 inch, 21 inch, 24 inch, 30 inch and 36 inch (refer to City of Durham Water and Sanitary Sewer Specifications).
3. A private sanitary sewer main shall be no less than 6" in diameter. The Engineer designing the sanitary sewer main shall sizing provide calculations (sealed and signed).
4. A sanitary sewer main is a collection system of 2 or more laterals, or as defined by the definition in Section 3.0 Permitting. A sanitary sewer permit is required for all sanitary sewer mains, and as defined by Title 15A of the North Carolina Administrative Code, Subchapter 2H.

B. Slope Requirements

Minimum slope requirements for all pipe sizes are achieved by maintaining a minimum velocity of 2.5 ft/s through the pipe when flowing half full. The minimum slope of any particular sanitary sewer main will also govern the capacity of this pipe. Maximum slopes on sanitary sewer mains are 10% unless specific approval from the Engineering Division is obtained. The Engineering reserves the right to require specific slopes as needed to insure future service and maintenance needs. Minimum slope requirements are:

6" diameter pipe - 1.00% minimum slope (private line size)
8" diameter pipe - 0.50% minimum slope
10" diameter pipe - 0.28% minimum slope
12" diameter pipe - 0.22% minimum slope
15" diameter pipe - 0.15% minimum slope
18" diameter pipe - 0.12% minimum slope
21" diameter pipe - 0.10% minimum slope
24" diameter pipe - 0.08% minimum slope

C. Sanitary Sewer Line Material

1. Standard sanitary sewer line material is to be PVC (schedule 35 for sanitary sewer mains and outfalls and schedule 40 for 4" and 6" sanitary sewer laterals) or, ductile iron class 350 pressure (refer to Engineering Division Water and Sanitary Sewer Specifications).
2. All sanitary sewer mains located in casing pipes shall be DIP.

No transition of materials shall be allowed except at manholes.

III. Sanitary Sewer Line Location

A. Depth

1. Sanitary sewer mains shall be designed meeting minimum depth requirements for both sanitary sewer outfalls and street mains. Sanitary sewer outfalls shall maintain a minimum depth of 4 feet from the ground elevation to the pipe crown . Sanitary sewer mains in the street require a minimum depth of 5 feet from the ground profile to the pipe crown. If a minimum depth of 3 feet cannot be met, ductile iron pipe instead of PVC sanitary sewer pipe will be required.
2. Sanitary Sewer lines greater than 20 feet deep shall be ductile iron, have a minimum of 5-foot diameter manholes and the City may require parallel and/or oversized sewer lines with wider easements.
3. Pipe tops are to be kept 2 feet below streambed flow line elevations to avoid aerial stream crossings. The pipe shall be placed to center the crossing at the midpoint between joints of the pipe (keeping the joints as far from the creek as possible).

B. Location

1. Sanitary sewer lines are normally located (unless it is an outfall):
   a. Under pavement within the right-of-way.
   b. On the south and west sides of streets.
   c. In the center of the driving lane of the street.
   d. Terminate all sanitary sewer mains with manholes.
   e. 18" below or 10' horizontal from water lines. If unable to maintain either of these separations or sanitary sewer crosses over water both lines shall be made of ductile iron for a minimum of 10' to either side of the crossing with the midpoint of pipe being centered at the point of intersection.
   f. With 12" separation from storm drainage lines.

C. Easements and Encasements

1. Where required a storm drainage pipe shall be installed across the sanitary sewer easement. The size of the pipe shall be determined using the 2-year storm event when it does not create a flooding problem. The City of Durham reserves the option to require an additional analysis based on a larger storm event and subsequent increase in storm pipe size.
2. Public sanitary sewer easements shall be no less than 30 feet and may be greater depending upon depth and location.
3. Private sanitary sewer main easements shall be no less than 30 feet and may be greater depending upon the depth and location.
4. Private sanitary sewer service easements shall be no less than 15 feet.
5. All sanitary sewer easements shall be drivable: Max longitudinal slope = 5:1 (H:V); Max cross slope = 10:1 (H:V)
6. Building setbacks shall be a minimum of 5 feet from all sanitary sewer easements where the depth to invert is less than 15 feet. If the depth to invert is greater than 15 feet the building setback shall be a minimum of 10 feet.
7. All sanitary sewer mains shall be located within a street right-of-way or permanent sanitary sewer main easement to allow city personnel access to the main for maintenance and repair. Approval of the sanitary sewer main extension shall be contingent upon the procurement of all necessary easements.
8. No landscaping is allowed in existing or proposed sanitary sewer easements. Earthwork may be allowed with City of Durham approval. Typical submittal shall be a plan and profile provided at the site plan stage. All earthwork must be completed before sanitary sewer is installed.

9. Encasements for mains are required for crossing NCDOT roads/streets and may be required for crossing City of Durham roads/streets. Refer to the City of Durham Water and Sewer Construction Specifications for pipe encasement details. See the table in Section 5.0 for encasement sizes. NCDOT and the railroads may have more stringent requirements.

10. No sediment traps, including temporary, shall be located in sanitary sewer easement or around manhole.

IV. Manholes

A. Locations

1. Manholes shall be used when sanitary sewer lines change slope or direction.
2. Manholes shall be used when sanitary sewer lines 6" and greater intersect.
3. Manholes shall be spaced no greater than 400' apart.

B. Invert and Rim Elevations

1. The maximum separation of invert in to invert out within a manhole is 0.50 feet.
2. Rim elevations along outfalls are to be a minimum of 3.0 feet above existing ground elevation. Depending upon the height, the City of Durham Engineering may require flat manholes, exterior steps and safety bars on top of manhole.
3. In flood plain areas, the 100-year flood elevation shall be noted on the drawings and the rim elevations are to be set at 2 feet above the 100-year flood elevation.
4. Along outfalls, sealed top manholes with vents may be utilized but only with the approval of the Engineering Division.

C. Drop Connections

1. Drops connections shall be outside drops (City of Durham Standards) unless approved by the City of Durham Engineering Division. The entire drop and upstream pipe shall be ductile iron.
2. Drop connections are required when the difference between invert in and invert out is greater than 0.5' (refer to Engineering Water and Sanitary Sewer specifications).
3. The minimum difference between the upper and lower inverts of the drop is 2 feet for 8-inch diameter sanitary sewers. Lines larger than 8" may require more height. The drop connections should be labeled on profile view.

D. Manhole Diameter

1. Sanitary sewer mains from 8 inches up to but not including 18 inches in diameter require manholes to be 4-feet in diameter. Sanitary sewer mains that are 18 inches in diameter and greater will require a manhole diameter determined by the Engineering Division.
2. When the depth of the manhole exceeds 20 feet (measured from the rim to invert of the manhole) the manhole shall be a minimum 5-foot diameter.
3. Larger diameter manholes, when necessary, may be required by Engineering.
4. Depending on the number of lines entering the manhole and the angle of the lines entering the manhole, a larger diameter may be required by Engineering Division.

V. Sewer Taps

1. 4-inch lines should tap sewer mains instead of manholes where possible (exception would be cul-de-sacs, which must be tapped at the invert of the manhole).
2. 6-inch taps and larger will require a manhole at the sanitary sewer main.
3. Terminal manholes in cul-de-sacs are limited to five - four inch lateral services.
4. New taps into manholes shall be core drilled and installed with a flexible rubber boot.

VI. Anchors

1. For sanitary sewer mains less than 20% slope, there are no anchoring requirements.
2. For sanitary sewer mains greater than 20% and less than 35% slope, anchors will be required a maximum of 36 feet apart.
3. For sanitary sewer main slopes of 35% to 50%, anchors will be necessary at a maximum of 24 feet apart.
4. For sanitary sewer mains with slopes greater than 50%, anchors will be required at a maximum of 16 feet apart.

VII. Creek Crossings (Aerial)

Ductile iron lock-joint pipe will be required for all creek/river/aerial crossings. Concrete supports and/or piers may also be required depending on the depth and span of the creek/river. All aerial crossings require the pipe or casing pipe to be at least 1' above the 10-year flow depth and at least above the 25-year flow depth.

VIII. Services

Sanitary sewer services shall be installed according to the City of Durham standards and specifications. Standard requirements are:

1. Cleanouts every 75' maximum.
2. 'Y' Cleanouts shall be installed at the right-of-way line or at the sewer easement line. Use of combinations are not permitted.
3. Whenever possible, laterals shall be perpendicular from the sanitary sewer main to the clean out at the right-of-way or the sanitary sewer easement.
4. When cleanouts are necessary in traffic areas, they shall be built according to the City of Durham details.
5. Cleanouts that are not traffic bearing are to be flush with the ground with an 18"x18"x4" concrete (3000 psi min.) protective collar.
6. Cleanouts are to be installed according to the City of Durham details.
7. Laterals to be installed at the following minimum grade:
   a) 4" @ 2%
   b) 6" @ 1%
8. Pool drain shall be tied into sanitary sewer. Discharge into pool drain must be by pumping, not gravity.
9. Carwash drain shall be tied into sanitary sewer. The drain shall be placed such that it will not collect rainwater and should be located under a roof, with the area beyond the roof sloping away from the drain. The drain line shall contain a grit separator and oil/water separator.
10. Dumpster pads for food service establishments and all establishments utilizing a compactor shall have a drain connected to the sanitary sewer. The areas beyond the dumpster/trash compactor pad shall be sloped to drain away from inlet.
11. All force mains that are covered under the plumbing code shall discharge by gravity into public lines starting at the right-of-way line.

IX. Force Mains

A. General

1. All public force mains shall be ductile iron and be sized a minimum of 2" diameter with a minimum design velocity of 2.5 feet per second but not greater than 10 feet per second. Plan and profile drawings are required. See the Section 2.1 Construction Plan Approval Process.

2. For private force mains, the Engineer shall submit designs to City of Durham Engineering Division (see Section 2.1 Construction Plan Approval Process) and shall also conform to requirements of the State of North Carolina. The private force main shall connect to a standard gravity service cleanout at the ROW or easement line.

3. All ductile iron pipe used for force mains shall be lined with *Protecto 401*, or equivalent (approval by Engineering Division required), to reduce corrosive action. This is only required where the water column separates from the pipe and creates an air pocket (at high points with air release valves).

X. Pump Stations

A. General

1. For projects involving a sanitary sewer pump station, the applicant shall contact the City Engineering Division prior to submittal of site plan or construction plans. This is to determine if the station is required or if there is a gravity option, whether or not the station will be public or private and to determine the designs that apply. The Environmental Resources Department shall decide on types of equipment, station layout and pump operation characteristics.

B. Surface Pump station Design Checklist (Public)

1. Verbatum Modular Series SFP monitoring system (additional monitoring may be required).
2. Telephone line for telemetry required.
3. Extra contacts on starters (all pumps) with fax telemetry.
4. High level float switch for telemetry high level alarm (normally open)
5. Low level float switch for telemetry low level alarm (normally closed.
6. 8 ft. high fence (including 3 strands of barbed wire)
7. 12 ft. double gate w/fencing.
8. All weather drive w/turnaround outside gate.
9. Generator required.
10. Safety transfer switch for generator connection.
11. Bar screens if required (must have mechanical cleaning system).
12. Water service for wash down where water is available
13. Backflow preventer and meter box connections for water service
14. High alarm light/horn w/optional silencer button for horn (only if ADS system not supplied)
15. Spare parts (seals, gaskets, filters, etc.)
16. Overhead power feed is not to pass over station or drive
17. Electrical service to be located inside fence
18. Adequate facilities for motor and pump removal
19. Photohelic gauge (if bubbler system is used) series 3000 Dwyer
20. Gravel surface to extend 6” beyond the fence.
21. Outside pole light (wired through station breaker)
22. Pressure gauges, cocks and valves
23. Hand rail grips for climbing down manholes or wet well
24. Run time meters
25. Control power transformer

26. 3 sets of operation, maintenance, parts and electrical manuals/schematics for transformer
27. No shared access drives
28. Posts and chains at some drive entrances (located 30 ft. from entrance)
29. Heater
30. Blower and lights w/manual, and automatic operation with a timer switch.
31. Station must have clearance for drainage
32. Station must have adequate working room to work on motors, pumps, valves, etc. without mechanically disassembling the housing cover

C. Below Ground Pump station Design Checklist (Public)

1. Sump Pump (that is in the lowest spot on floor)
2. Dehumidifier
3. Verbatum Modular Series SFP monitoring system (additional monitoring may be required).
4. Telephone line for telemetry required
5. Extra Contacts on starters (all pumps) for telemetry
6. High level float switch for telemetry high level alarm (normally open)
7. Low level float switch for telemetry low level alarm (normally closed)
8. 8 ft. high fence (including 3 strands of barbed wire)
9. 12 ft. double gate w/fencing
10. All weather drive w/turnaround outside gate
11. Generator required
12. Safety transfer switch for generator connection
13. Bar screens if required (must have mechanical cleaning system)
14. Water service for wash down where water is available
15. Backflow preventer and meter for connections for water service
16. High alarm light/horn w/optional silencer button for horn (only if ADS System not required)
17. Spare Parts (seals touch-up paint, gaskets, filters, etc.)
18. Overhead power feed is not to pass over station or drive
19. Electrical service to be located inside fence
20. Adequate facilities for motor and pump removal
21. Photohelic gauge (if bubbler system used) Series 3000 Dwyer
22. Gravel surface to extend 6” outside fence.
23. Outside Pole Light (wired through station breaker)
24. Pressure gauges, cocks and valves
25. Hand rail grips for climbing down manholes or wet well
26. Run time meters
27. Sacrificial anodes
28. Control Power transformer
29. 3 sets of operation, maintenance, parts and electrical manual/schematics
30. NO shared access drives
31. Post and chains at some drive entrances (located 30 ft. from entrance)

32. Blower/Light switch which comes on automatically when entering station and with manual switch

33. Timer for Blower when no one is in station

XI. Sanitary Sewer Abandonment

A. Sanitary Sewer Main and Manholes

1. Abandonment of manholes shall consist of removal of manhole structures to 3 feet below finished grade, filling the manhole with concrete to an elevation of 1 foot above the crown of the pipe and filling the remaining portion with stone. The area of this removal shall be backfilled with clay and compacted well.
When sanitary sewer mains are abandoned, 5 lineal feet of sanitary sewer nearest the sanitary sewer to remain live shall be filled with concrete.

B. Services

1. Abandonment of sanitary sewer service lines shall consist of plugging the lateral at the right-of-way line.

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SECTION 8.0

STORMWATER DESIGN CRITERIA

This section is intended to provide design criteria for stormwater design of stormwater Best Management Practices (BMPs), open channels, culverts and pipes. All designs should be submitted as per Section 2.1 Construction Plan Approval and per the design summaries found in Section 8.4

I. General

Grading permits covering sedimentation and erosion control measures must be obtained from the Durham County Soil and Erosion Control Office before construction can commence. Contact the Durham County Soil and Erosion Control Office at (919) 560-0736.

II. Runoff Calculations

Runoff calculations shall be provided for all proposed storm drainage structures including, but not limited to culverts, storm drain systems, inlets, ditches, open channels, BMPs, outlet protection, etc. and shall be sealed and signed by a registered Professional Engineer. Runoff calculations shall be provided in an 8.5" X 11" format (refer to checklists found in Section 1.3 and Section 2.2) with the exception of the drainage area maps and shall include:

A. Drainage area maps.

B. Mapping provided shall delineate the site area and the watershed area for proposed improvement. Copies of topographic mapping (200/400 scale and digital format) are available from the City of Durham GIS Division (919-560-4122). A USGS map may be used only if that is the best available information. The map scale, north arrow, analysis point(s), time of concentration flow paths and drainage area for each sub-basin must be shown. The various segments (sheet/overland, shallow concentrated and ditch/open channel/pipe flow) are to be labeled on the drainage area maps. Pre- and post-development maps are required for a Stormwater Impact Analysis.

C. Copy of Durham County Soil Survey map with the site highlighted shall be provided. List all of the soils on the site and their corresponding Hydrologic Soil Group (HSG, see Table 1).

D. Runoff Coefficient Calculations (C/CN). It must be shown in the calculations how the composite runoff coefficient was determined. Simply providing a composite runoff coefficient with no supporting documentation is not acceptable.

Table 1
Hydrologic Soil Group for Soils in Durham County

Soil Abbreviation	Soil Type	Hydrologic Soil Group
AiA	Altavista	C
AiB	Altavista	C
ApB	Appling	B
ApC	Appling	B
Cc	Cartecay	C
CfB	Cecil	B
CfC	Cecil	B
CfE	Cecil	B
Ch	Chewacla	C
Cp	Congaree	B
CrB	Creedmoor	C
CrC	Creedmoor	C
DaB	Davidson	B
DaC	Davidson	B
GeB	Georgeville	B
GeC	Georgeville	B
GeD	Georgeville	B
GiE	Goldston	C
GiF	Goldston	C
GrB	Granville	B
GrC	Granville	B
Gu	Gullied Land	D
HeB	Helena	C
HeC	Helena	C
HrB	Herndon	B
HrC	Herndon	B
HsC	Herndon	B
IrB	Iredell	D
IrC	Iredell	D
IuB	Iredell	D
IuC	Iredell	D
LgB	Lignum	C
MfB	Mayodan	B
MfC	Mayodan	B
MfD	Mayodan	B
MfE	Mayodan	B
MrC	Mayodan	B
MrD	Mayodan	B
MuB	Mecklenburg	C
MuC	Mecklenburg	C
NaD	Nason	C
NaE	Nason	C
NoD	Nason	C
PfC	Pinkston	B
PfE	Pinkston	B
Ro	Roanoke	D
TaE	Tatum	C
Ur	Urban Land	D
Wh	Wahee	D
WmD	Wedowee	B
WmE	Wedowee	B
Wn	Wehadkee	D
WsB	White Store	D
WsC	White Store	D
WsE	White Store	D
WwC	White Store	D
WwE	White Store	D
WvC2	White Store	D
WvE2	White Store	D
WxE	Wilkes	C

1. Rational Formula

a. Refer to the following acceptable Rational Formula C values in Table 2 (Highway Drainage Manual, Maryland State Highway Administration, 1981 and Stormwater Design Manual, City of Raleigh, NC, 2002) that are based upon the Hydrologic Soil Group. There are no Hydrologic Soil Group A soils within Durham County. Refer to Table 1 for the appropriate Hydrologic Soil Group for the soil types within Durham County.

b. The C values in Table 2 are only acceptable for storm events less than or equal to the 10-year storm event. To correct for storm events greater than the 10-year storm event, a correction factor (multiplier) is provided in Table 3 (Municipal Storm Water Management, Debo and Reese, 1995). C value will never be greater than 1.0.

c. The Residential, Commercial and Industrial C-values can only be used for estimating the flow rates for offsite areas. For the specific project site C value, a composite C value must be developed.

Table 2
Rational Formula C Values for Storm Events Less Than or Equal to the 10-year Storm Event

Land Use	Hydrologic Condition	HSG B*	HSG C*	HSG D*
Pasture/Range	Poor	0.33	0.38	0.41
	Fair	0.25	0.33	0.37
	Good	0.20	0.29	0.34
Meadow		0.14	0.17	0.20
Wooded	Poor	0.17	0.22	0.26
	Fair	0.15	0.19	0.23
	Good	0.13	0.17	0.20
Open Space and Lawns		0.25	0.30	0.35
Paved areas, gravel and other impervious areas		0.95	0.95	0.95
Residential Single Family**	**Zoning**			
	R-3 (3,000 ft^2 lots)	0.63	0.65	0.67
	R-5 (5,000 ft^2 lots)	0.51	0.54	0.57
	R-8 (8,000 ft^2 lots)	0.47	0.51	0.54
	R-10 (10,000 ft^2 lots)	0.46	0.50	0.53
	R-15 (15,000 ft^2 lots)	0.41	0.45	0.48
	R-20 (20,000 ft^2 lots)	0.34	0.39	0.43
	RD (30,000 ft^2 lots)	0.30	0.33	0.35
Residential Multi Family**	**Zoning**			
	RM-8 (8 units/acre max)	0.60	0.65	0.70
	RM-12 (12 units/acre max)	0.65	0.70	0.75
	RM-16 (16 units/acre max)	0.70	0.75	0.80
	RM-20 (20 units/acre max)	0.75	0.80	0.85
	RM-NC-40 (40 units/acre max)	0.75	0.80	0.85
	RM-NC-60 (60 units/acre max)	0.75	0.80	0.85
	RM-NC-80 (80 units/acre max)	0.75	0.80	0.85
Commercial, Retail, Office, Mixed Use and Institutional**		0.80	0.85	0.90
Industrial**		0.80	0.85	0.90

* HSG refers to the Hydrologic Soil Group
** These C-values can be used only to develop flow rates for offsite areas.

Table 3
Frequency Correction Factors for Rational Formula C-Values

Recurrence Interval (years)	C_f
25	1.1
50	1.2
100	1.25

d. The Rational Formula cannot be used for areas more than 50 acres, refer to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) method below.

e. To determine the intensity for the Rational Formula, the following equation can be used, refer to Table 4 for the values of g and h for different return periods:

$$I = g/(h+T_C)$$

I = Intensity in inches per hour
T_C = Time of Concentration in minutes (Refer to **2. b.** below to determine T_C)

Table 4
Variables for Intensity Equation

Return Period	g	h
2	132	18
5	169	21
10	195	22
25	232	23
50	261	24
100	290	25

2. USDA NRCS Hydrologic Urban Hydrology for Small Watersheds (Formerly the SCS Method)

a. For determining the curve number values, refer to the NRCS TR-55 manual recommendations, which can be found at http://www.wcc.nrcs.usda.gov/hydro/hydro-tools-models-tr55.html.

b. Pre- and post-developed time of concentration flow paths shall be delineated on drainage maps and shall be representative of the project site. The TR-55 segmented approach shall be used for computing times of concentration for both the pre-development and post-development condition. Assuming a time of concentration is not acceptable. Maps and calculations are to be submitted with all plans with a NCPE seal and signature. Drainage area maps shall be updated to reflect relevant existing conditions and development. The post-development sheet flow length shall be no more than 50 ft unless it can be shown that the sheet flow depth is 0.10 ft or less. Refer to Table 5 below for the appropriate Manning's n values as defined in the NRCS TR-55 manual for sheet flow. The remainder of the flow path shall be shallow concentrated or channel flow as appropriate. For discussions concerning the time of concentration flow path, the TR-55 manual can be downloaded at http://www.wcc.nrcs.usda.gov/hydro/hydro-tools-models-tr55.html.

Table 5
Manning's n Values for Sheet Flow (Flow Depths of < 0.10 Feet)

Surface Description	Manning's n Values
Smooth Surfaces (concrete, asphalt, gravel or bare soil)	0.011
Short Grass	0.15
Dense Grass	0.24
Woods, light underbrush	0.40
Woods, dense underbrush	0.80

III. Stormwater Layout

A. Design

1. Storm drain systems and culverts shall be sized with a minimum of the 10-year intensity storm event or 25-year event with the pipe flowing full, see Table 6 below. The HGL shall not exceed the top of structures or gutter elevations as appropriate for the 25-year intensity storm event. Include hydraulic grade line (HGL) calculations with storm drain sizing calculations. HGL calculations shall take into account all head losses, friction factors and bypass flows.

   Inlet control calculations must be provided showing HW/D less than or equal to one for culverts for the design event or offsite improvements may be required.

   Outlet control calculations must also be provided. The downstream hydraulic gradient at the outlet end of the culvert shall begin at the water surface elevation as computed from backwater calculations starting at a downstream channel cross-section where the channel constricts or shall begin at the downstream crown of the culvert, whichever is greater. These calculations must show that the HW/D is less than or equal to one for the design event.

   Open channel conveyance systems shall be sized with a minimum of the 10-year intensity storm event or 25-year event with the design storm contained within the channel banks with non-erosive velocities or suitable channel lining.

   Culverts and drainage systems shall be sized using current zoning for offsite areas.

   All storm drain road crossings and open channel conveyance systems shall pass the 100-year storm without inundating the driving surface or existing or proposed structures.

   Sealed calculations used for drainage design shall be submitted to the City of Durham Engineering Division.

Table 6
Design Criteria for Stormwater Conveyance Systems

Storm Drain Systems and Culverts		
Stormwater Conveyance System	**Design Storm**	**Design Criteria**
Drainage Basins less than 100 acres	10-year	HW/D must be less than or equal to 1 for both inlet and outlet control conditions.
Drainage Basins greater than or equal to 100 acres	25-year	HW/D must be less than or equal to 1 for both inlet and outlet control conditions.
Open Channel Conveyances		
Stormwater Conveyance System	**Design Storm**	**Design Criteria**
Drainage Basins less than 100 acres	10-year	10-year storm event must be contained within channel banks with non-erosive velocities or suitable channel lining.
Drainage Basins greater than or equal to 100 acres	25-year	25-year storm event must be contained within channel banks with non-erosive velocities or suitable channel lining.

2. The minimum pipe diameter shall be 15 inches. Pipe systems and culverts shall be at a one percent (1%) minimum slope. Slopes less than one percent (1%) may be accepted with the Stormwater Services Division's approval.

3. Acceptable Pipe Materials - Inside Right-of-Way

a. Reinforced Concrete Pipe
b. Structural Plate Pipe with full bituminous coating inside and out and a paved invert
c. Corrugated Metal Pipe with full bituminous coating inside and out and a paved invert
d. Corrugated Aluminum pipe (aluminized pipe is not acceptable)

Acceptable Pipe Materials - Outside Right-of-Way

a. Reinforced Concrete Pipe.
b. Structural Plate Pipe with full bituminous coating inside and out and a paved invert.
c. Corrugated Metal Pipe with full bituminous coating inside and out and a paved invert.
d. Corrugated Aluminum pipe (aluminized pipe is not acceptable).
e. Ductile Iron Pipe
f. HDPE Pipe (Double wall with smooth interior) – may be used in residential driveway applications. It may also be used in other non-traffic bearing applications outside of the right-of-way up to a diameter of 48 inches. Pipes shall meet the requirements of AASHTO M294, Type S and D. Joints shall meet the requirements of AASHTO M294, Type S and D, with gaskets on the spigot end of the pipe. Gaskets within joints shall be rubber and meet ASTM F-477. Installation shall be as per the latest City of Durham specifications with the exception that the pipe embedment material shall be limited to ASTM D 2321 Class IA, IB, II and III materials.

Class I – Angular crushed stone or rock, dense or open graded with little or no fines (1/4 inch to 1 1/2 inches in size).

Class II – (GW, GP, SW, SP, GW-GC, SP-SM) Clean, coarse grained materials, such as gravel, coarse sands and gravel/sand mixtures (1 1/2 inches maximum size) (AASHTO classifications A1 and A3).

Class III – (GM, GC, SM, SC) Coarse-grained materials with fines including silty or clayey gravels or sands. Gravel or sand must comprise more than 50 percent of Class III materials (1 1/2 inches maximum size) (AASHTO classifications A-2-4 and A-2-5).

4. An overall drainage and grading plan shall be provided showing existing and proposed contours.

5. Adequate drainage controls shall be provided at all street intersections, usually upstream of the intersection. Gutter spread calculations shall be provided on all public improvements, private streets and as required by the City of Durham. Gutter spread is not to exceed 1/2 a travel lane for the 2-year storm event. Bypass shall be limited to less than 0.10 cfs into an intersection for the 2-year storm event. Gutter spread Calculations shall include the following information:

1) All flow rates shall be provided in cfs to the nearest hundredth of a cfs.
2) All bypasses shall be noted. This note shall include the inlet that it will be directed to.
3) All bypass flows shall be accounted for in gutter spread calculations.
4) Half of a travel lane is calculated as half of the pavement section plus the width of the gutter (see Table 7 below). Gutter spread calculations for parallel parking are identical to the standard street section before parking was added.
5) Cul-de-sacs shall have a maximum spread of ½ the travel lane of the road stem of the cul-de-sac.
6) All gutter spread calculations shall be referenced by methodology and/or equations.
7) Curb inlets are not allowed within the radii of driveways or street intersections.
8) For sump conditions, use a 50% clogging factor to determine the inlet capacity.
9) Provide a table of checks for spread calculations and bypass as shown below in Table 8.

Table 7
Allowable Gutter Spread for Typical Back-Back Widths

B-B Width (ft) (24" Curb and Gutter)	Allowable Gutter Spread (ft)	B-B Width (ft) (30" Curb and Gutter)	Allowable Gutter Spread (ft)
22	6.0	23	6.5
24	6.5	25	7.0
26	7.0	27	7.5
32	8.5	33	9.0

Table 8
Example Table of Checks for Spread Calculations and Bypass

Inlet #	Bypass Inlet	Spread (ft)	Allowable Gutter Spread (ft)	Check	Bypass (cfs)
CB1	CB2	5.5	6.0	Pass	
CB2	CB3	6.1	6.0	Fail	

6. Storm drain outfalls shall be piped to the rear of any existing or proposed buildings and released to the natural drainage ditch or stream. It may be necessary to cross intervening property and obtain private drainage easements to ensure discharge into natural watercourse. All costs shall be borne by the developer. Receiving water courses shall be evaluated for adequacy (refer to Section 8.1 10% Storm Water Rule).

7. Flared-End-Sections or headwalls are required at beginning and end of all storm water pipes. Headwalls and endwalls or flared end sections are required on all pipes, however Stormwater Services reserves the right to require headwalls and endwalls instead of flared end sections or vice versa. Riprap or an approved alternative (permanent synthetic liners, stilling basins, level spreaders, etc) will be required as necessary.

8. Storm drain pipes are to extend to right-of-way or beyond improvements.

9. Storm drainage pipe and structure information table shall be listed on each sheet of construction plans and profile drawings. This information shall include pipe diameter, material, grade, inlet and outlet inverts, structure type, drainage area and flow into the pipe structure. This information should be written in a table format with corresponding pipe or structure numbers shown in plan view.

10. When drainage ditches cross sanitary sewer easements, storm drain pipes are to be installed. The pipes are to be sized to accommodate the 2-year storm event flow of the ditch. See the requirements under **1.** above. The pipe shall extend the entire width of the easement.

11. Provide riprap or approved alternative outlet protection calculations for all storm drain outlets.

12. Provide open channel design calculations for all channelized storm drain flow, see requirements under **1.** above.

13. Stormwater easements for pipes are to be calculated as follows: Width of storm drain easement equals 14 ft plus the outer diameter plus 2 ft for every 1 ft of vertical depth greater than 5 ft. The depth shall be measured from the top of the ground to the invert of the pipe.

14. Stormwater easements for channels are to be calculated as follows: Easement width equals the channel width measured from the top of bank, plus 7 ft from the top of bank on each side of the channel.

15. Excessively deep storm sewers shall have an additional building setback from the easement. Storm sewers that are between 10 feet and 15 feet measured from the ground surface to the pipe invert shall have an additional building setback from the easement of 5 feet. Storm sewers deeper than 15 feet shall have a 10 foot building setback. Minimum building setback on all storm sewer easements shall be 2 feet.

16. A recorded drainage easement is provided for each BMP including access to the nearest right-of-way. The access width shall be a minimum of 20 feet and the easement around the BMP shall be a minimum of 10 feet from the 10-year water surface elevation in the BMP.

17. All stormwater easements shall be drivable: Max longitudinal slope = 5:1 (H:V); Max cross slope = 10:1 (H:V).

B. Stormwater Quality/Quantity Best Management Practices (BMPs)

1. Specific locations determined by the Public Works Department within a site deemed to be pollution hot spot sources will require discharge to the sanitary sewer system or adequate treatment.

2. Stormwater Quality BMPs shall be designed in accordance with the Stormwater Best Management Practices Manual, N.C. Department of Environment and Natural Resources, April 1999 or latest and the City of Durham design summaries. Provide a design summary form with design calculations (wet detention ponds, sand filters, bioretention areas and dry detention ponds) with the initial construction drawing submittal. The design summaries can be found in Section 8.4.

3. Stormwater detention ponds shall be routed using the following accepted methods:
   a. Areas less than or equal to 10 acres - Chainsaw method or Storage Indication method (TR-20, HEC-1, etc.).
   b. Areas greater than 10 acres - Storage Indication method (TR-20, HEC-1, etc.).

4. Stormwater BMPs must be located on common open space in a single/multi-family project.

5. The 100-year event cannot overtop any dam embankments. An emergency spillway shall be provided.

6. The top width of any dam embankment shall be a minimum of 10 ft.

7. Additional design requirements for specific stormwater BMPs can be found within the individual BMP design summary sheets in Section 8.4. A design summary must be provided with the construction drawing submittal. If a design summary does not exist for the BMP then a summary of design standards and references must be submitted. Coordination with the Stormwater Services Division is required for BMPs not covered by the design summaries or other BMP manuals.

C. Construction

1. If RCP is used at a stream, then an 8-foot joint must be used at the lower end (nearest the stream) because of possible undermining.

2. Storm drain pipes or drainage ways shall have a minimum 12 inches of cover. Pipe diameters 30" and larger shall be deep enough to accommodate drainage structures.

3. Storm drain pipes or drainage ways shall have at least a one-foot vertical distance from all water and sanitary lines.

4. Street catch basins shall be City standard catch basin type II or NCDOT 840.01 where applicable. Pre-cast structures may be allowed, requiring inverts to be factory cut.

5. Yard inlet catch basins shall be Type A, B, III, IV and V as shown in the City of Durham Street Construction Specifications.

6. For public streets crossed with an open-ended 24" pipe or larger, a 4' high PVC coated dark green chain link fence will be required at the right-of-way for a length measured from the culvert to the end of the fill section.

7. Transition between different pipe materials shall be by a structure and not by a coupling.

D. Floodplain and FEMA Flood Zones

1. All floodplains with cross-sections and FEMA Flood Zones shall be shown on every site plan, preliminary plat, construction drawing plan and final plats. Base flood elevations and floodways shall be shown if applicable. If the floodplain is proposed to be changed, both the existing and proposed floodplain shall be shown. If a CLOMR is required, it must be obtained from FEMA before site plan or preliminary plat approval and a LOMR must be obtained before applying for building permits.

2. Refer to the City of Durham Flood Damage Protection Ordinance for further information.

3. Refer to the City of Durham Zoning Ordinance for further information.

4. A detailed flood study is required for FEMA designated Zone A designated floodplains where the project site is 5 acres or greater in area or if 50 or more lots are proposed.

5. No encroachment is allowed into the floodway unless a registered Professional Engineer can demonstrate a no-rise condition.

6. Proposed development or fill in areas currently within the base flood are required to show the lowest finished floor elevation (including duct work) and proposed grading.

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SECTION 8.1

STORMWATER CONTROL AMENDMENT INFORMATION (OR THE "10% STORMWATER RULE")

Amendment to:

Section 8.1 of the Durham Zoning Ordinance
Section 19-5(n) of the Durham Subdivision Ordinance
Section 23-145 of the Durham City Code

Adopted by the Durham City Council on April 23, 1997
Adopted by the Durham Board of County Commissioners on February 9, 1998

Requirement (as written in the ordinance amendment)

Properties and waterways downstream from land development sites may be adversely impacted from increases in volume, velocity and peak flow rates. Any land-disturbing activity which results in an increase of impervious area may be required to provide stormwater management facilities or make other improvements to the existing drainage system to address water quantity concerns, water quality concerns, or both if the proposed development will increase potential flood damages to existing properties or significantly increase pollutant levels in downstream receiving waters.

Prior to the approval of any subdivision or site plan or the issuance of a building permit for any structure other than a single-family residence, the owner of the property proposed for development shall submit a stormwater impact analysis that complies with the requirements of the City Engineer and which determines the impact of the increased stormwater runoff on downstream stormwater facilities and properties whenever the peak runoff rate from either the 2-year storm or the 10-year storm increases by more than 10 percent as a result of the proposed development. The City Engineer shall determine the need for stormwater management facilities to address offsite impacts. Stormwater management facilities shall be designed and maintained in accordance with Section 5.5.7.2 of the Durham Zoning Ordinance.

Purpose

The purpose of this requirement is to assess potential flooding and water pollution impacts on existing downstream areas as a result of new development before the development occurs. It is applicable to those projects requiring zoning approval, subdivision approval or a building permit.

It should be noted that a 10 percent increase in runoff rates does not automatically mean that a project will be required to provide detention or make drainage improvements.

Process

This must be performed by a North Carolina Registered Professional Engineer. The Stormwater Services Division's site plan checklist located in Section 1.3 provides a summary of all required items.

The applicant's engineer must proceed through the following steps:

1. Use TR-55/TR-20, HEC-HMS, HEC-1 or the Rational Formula (refer to Section 8) to calculate the pre- and post-development discharges for each point of discharge from the site. A reduction in "overall" site imperviousness does not eliminate the requirement for an impact analysis at "every point of discharge." It would also include those projects for which a building permit had been issued and was still valid. However, individual single-family residential lots may

be exempted. If runoff leaves the site at several points, the engineer must conduct a separate analysis for each point. In addition, downstream confluence points should also be checked.

2. If the post-development calculations do not show an increase greater than 10% in the pre-development 2- and 10-year peak discharges, then no further analysis is needed. If the calculations show an increase greater than 10% in the pre-development discharges, then an additional downstream analysis is required.

3. A site to drainage area analysis can be used to show that the site is a small percentage of the total watershed area. Further analysis between the site and the point of analysis of the total watershed area to determine the impact of the increase in discharge is required. See the table below for percentage thresholds for using the site to drainage area analysis.

Existing Land Use	Proposed Land Use	Threshold
Unimproved	~85% impervious - (ex) commercial, business c=0.75	If the total site area as a percentage of the total watershed area at the analysis point is 2.5% or less, your analysis is complete.
Unimproved	~70% impervious - (ex) townhouses c=0.6	If the total site area as a percentage of the total watershed area at the analysis point is 3% or less, your analysis is complete.
Unimproved	~35% impervious - (ex) 1/4 acre single family homes c=0.3	If the total site area as a percentage of the total watershed area at the analysis point is 10% or less, your analysis is complete.

4. Identify the downstream point at which the increase becomes less than 10%. Further analysis is required to determine the impacts of the increase between the site and the downstream point at which the increase becomes less than 10%. Identify what is located along the drainage corridor (swales, ditches, open channels, culverts, pipe systems, etc.). If there are no negative impacts, the analysis must specifically state that no structures (businesses, homes, culverts, streets) will be adversely impacted by the increase in site runoff. If no structures exist between the site and analysis points, state this in the study. All negative impacts on existing improvements (e.g. streets, culverts, etc.) and development (e.g. businesses, homes, lawns, etc) must be identified. All critical sites must be analyzed. Analyses should include, but is not limited to, inlet and outlet calculations for culverts and channel capacity calculations for drainage ways and storm drain systems. Photographs must be provided for the representative downstream channel cross-sections and all culvert inlets and outlets.

5. If the downstream system is inadequate, contact the Stormwater Services Division to discuss possible improvements and/or detention requirements.

6. PHASED DEVELOPMENTS, EXPANSION PROJECTS AND REDEVELOPMENTS

A. PHASED DEVELOPMENTS

There are two options for PHASED projects. The first option is to have post-development calculations, on the first submittal, reflect the complete build-out conditions, thus any conveyance, detention or treatment devices would be sized for the ultimate project build-out. The second option is to have later improvements and impact studies reflect the site before any development has taken place. The earlier (previous phase) submittal will not be considered as “existing” improvements for subsequent submittals.

B. EXPANSION PROJECTS

City of Durham: If the existing development was built after enactment of the City of Durham 10% Stormwater Rule (4/23/97) without 2- and 10-year stormwater controls, then the existing impervious surface cannot be used as the pre-development condition. The existing and proposed impervious surface must all be accounted for in the post-development weighted runoff coefficient.

Stormwater Impact Statement Submission Requirements (Revised 10/25/99, 03/19/03)

The following minimum information must be submitted as part of the Stormwater Impact Analysis:

1. Stormwater Services Site Plan Submittal Checklist found in Section 1.3 and a Stormwater Impact Analysis must be signed and sealed by a registered North Carolina professional engineer.
2. A narrative report shall be provided as part of the Stormwater Impact Analysis that includes at a minimum the following:
    a. an introduction that identifies the project location, including (Cape Fear or Neuse) River Basin, whether or not it is in a Water Supply Watershed (F/J-A, F/J-B, E-A, E-B, M/LR-A, M/LR-B) and if so which zone, site address, a description of the pre- and post-development land cover and a general description of the proposed improvements (# of lots, parking spaces, buildings and removal of existing impervious surfaces)
    b. description of the methodologies and procedures
    c. calculations with supporting documentation
    d. summary of results including pre- and post- discharges for each drainage area
    e. conclusion detailing the findings of the drainage investigation

3. A drainage map delineating the site area and the watershed area(s) for pre- and post-development. The study area is to incorporate all downstream tributaries until it is demonstrated that the increased runoff from the developed site is no longer increasing the existing flow by more than 10%. Sub-basins must be delineated for each point of discharge for the site. Copies of topographic mapping (200/400 scale) are available from the Department Public Works, Engineering Division. A USGS map may be used only if that is the best available information. The map scale, north arrow, analysis point(s) and time of concentration flow paths must be shown. Times of concentration calculations are to be computed using the TR-55 segmented approach and shall be representative of the site. The various segments (sheet/overland, shallow concentrated and ditch/channel/pipe flow) are to be labeled on the drainage area maps. A maximum of 50 feet can be used for the post-development sheet/overland flow segment unless it can be shown that the depth of sheet flow is 0.10 feet or less. Show the location of channels, ditches, swales, culverts and pipe systems analyzed on the drainage map. Digital maps are available from Technology Solutions at (560-4122).

4. A site plan or grading plan identifying the pre-development and post-development drainage patterns and imperious area coverage.

5. Calculations for the pre- and post-development discharges for the 2- and 10-year 24-hour storm using TR-55/20 HEC-HMS/1 or Rational Method. Complete calculations and all supporting documentation (including but not limited to calculation of composite runoff coefficients, time of concentration (pre- and post-), ditch/open channel analysis, storm drain analysis, culvert analysis, etc.). This includes all assumptions used in the calculations and necessary channel cross-sections or pipe information used for the downstream analysis. Land use information is available from the City/County Planning Department for use in determining runoff coefficients and times of concentration. A table summarizing the pre-development and post-development peak rates with no backup information is not acceptable.

Storm Water Impact Analysis submittals that do not meet the above minimum submittal requirements will be returned without review.

See Stormwater Services Site Plan Submittal Checklist in Section 1.3 for submittal requirements concerning buffers (City and Neuse), floodplain, Neuse Basin (1-year storm controls and nitrogen reduction) and Water Supply Watershed requirements.

SECTION 8.2

NEUSE RIVER BASIN PERFORMANCE STANDARDS

The following information is applicable to new development in the City of Durham portion of the Neuse River Basin. For information concerning Durham County, please contact the Durham County Engineering Department at 560-0735.

Under the Neuse River Basin Nutrient Sensitive Water Management Strategy, the City of Durham is one of 15 local governments required to develop and implement a stormwater management program to control nitrogen from new development. The effective date for program implementation is March 9, 2001.

For purposes of the Neuse stormwater program, new development is defined as follows:

"New development" means development within the Neuse River Basin for a project requiring site plan or subdivision approval of any type which, in the case of single family, duplex, or recreational development will result in land disturbance of greater than one acre, or in the case of multi-family, office, institutional, commercial, or industrial development will result in land disturbance of greater than one half acre. New development shall NOT include agriculture, mining or forestry activities. "Land disturbance" means grubbing, stump removal, removal of topsoil and coarse or fine grading.

The stormwater management program must address three elements that affect new development:

1. Limit the nitrogen export from new development to 3.6 pounds per acre per year
2. Control post-development peak flow rate for the 1-year, 24-hour storm
3. Protect and maintain existing riparian buffer areas

Site Plan and Subdivision Plan Submission Requirements

Applications for new development located in the Neuse River Basin shall include the following with all site plans and subdivision plans submitted to the Durham City/County Planning Department.

- A plan drawing showing 50-foot wide buffers immediately adjacent to all streams, lakes and water bodies that appear on EITHER the USGS 7.5 minute quad maps or the USDA SCS Soil Survey of Durham County.
- Documentation from the NC Division of Water Quality approving any activities that impact the Neuse buffers.
- Peak runoff calculations for the 1-year, 24-hour storm, pre-development and post-development conditions, at each drainage outlet.
- Nitrogen loading calculations for the pre-development and post-development conditions.
- Plans and supporting calculations showing how the nitrogen export limits and the peak runoff limits will be met. For any structural BMPs, the calculations shall include sizing and treatment design calculations. *These calculations and BMP design plans shall be submitted to the Durham City/County Planning Department with all site plan and subdivision plan applications.*
- If offset payments will be used to meet the nitrogen loading requirements, the applicant shall furnish proof that offset fees have been paid to the North Carolina Wetlands Restoration Fund before a site plan or subdivision plan can be approved.

Development Plan Submission Requirements

Applications for development plan approval must show Neuse riparian buffers on development plan drawings and provide a conceptual plan indicating how the development can meet the nitrogen export and the peak flow requirements. If one or more structural controls will be required for either the nitrogen export or peak flow

requirements, the location(s) of facility(s) shall be shown at each appropriate drainage outlet. Conceptual plans must provide enough detail to show that the plan is likely to work within the constraints of topography and space.

Controlling Post-Development Peak Runoff Rate

New development may not increase the post-development peak runoff rate from the 1-year, 24-hour storm at each point of discharge over the pre-development peak runoff rate by more than ten percent (10%).

If the post-development peak runoff rate does increase by more than ten percent, stormwater detention facilities shall be provided at each discharge point so that there is no increase.

Peak runoff calculations shall be made using the Peak Discharge Method as described in USDA Soil Conservation Service's Technical Release Number 55 (TR-55), "Urban Hydrology for Small Watersheds." For the 1-year, 24-hour storm, the rain depth to be used with this methodology is 3.0 inches.

The Rational Method cannot be used because no rainfall intensity-duration curves are available for the one-year storm in this part of the state.

New residential development is exempt from the peak runoff control requirement IF the impervious area does not exceed 15% impervious area and swales ***and*** other natural stormwater conveyances are used to the maximum extent practicable.

This requirement applies in the Neuse River Basin in addition to the City's existing requirements under the Stormwater Controls for Offsite Impacts Ordinance.

Note: If it can be conclusively demonstrated to the satisfaction of the Public Works Director that detention would result in equal or greater runoff in the receiving stream for the 1-year storm, then detention of the 1-year storm may not be required.

Application Guidelines

Peak flow will normally be evaluated at each point of discharge. The point of analysis for each discharge will be the point at which the flow enters the channel of a stream requiring Neuse buffers. The analysis of flow at this location may not include the flow in the Neuse stream itself, but may include incidental off site drainage that is conveyed to the point of analysis as overland flow or flow in ditches, pipes or other stormwater conveyances. If the stream does not border the site, the point of analysis may be taken either at the point the flow leaves the site, or the point it enters the Neuse stream.

Management of peak flow is not required if the increase is less than 10% for that outlet. If management is provided, the peak flow must be managed back to the pre-development condition (a 10% increase is not allowed.)

Neuse Riparian Buffers

The Neuse Buffer Rule is separate from the stormwater rule. However, the 15 local governments subject to the Neuse stormwater rule are required to ensure compliance with the Neuse buffer regulations.

The buffer rule requires local governments to ensure that 50-foot riparian buffers on both sides of intermittent and perennial streams and around lakes, ponds and estuaries are maintained and protected from new development.

The applicant shall show, on subdivision and site plans of all types, 50-foot wide riparian buffers immediately adjacent to all streams, lakes and ponds appearing on either the Durham County Soil Survey maps or the USGS 7.5 minute quadrangle maps.

For intermittent and perennial streams, the buffer shall begin at the most landward limit of the top of bank and extend landward on all sides of the surface water, measured horizontally on a line perpendicular to the surface water.

For ponds, lakes, and estuaries, the buffer shall begin at the most landward limit of the normal water level and extend landward, measured horizontally on a line perpendicular to the surface water.

The applicant shall demonstrate that the new development does not impact the Neuse buffer or that the North Carolina Division of Water Quality has approved the activity that impacts the Neuse buffer.

Applicants for new development approval should note that the Neuse buffer requirements are separate from the stormwater program requirements, and have different rules of applicability. Please refer to the buffer rule itself for information about the requirements to protect and preserve the Neuse riparian buffers.

A Fact Sheet on the buffer rules is appended to this guidance document. The Neuse buffer rules can be viewed at the North Carolina Division of Water Quality's website: http://h2o.enr.state.nc.us:80/nps/neuse.htm.

Nitrogen Export

New development is required to limit the amount of nitrogen loading to 70% of the 1995 average non-urban nitrogen load. This is equivalent to 3.6 pounds of nitrogen per acre per year.

The nitrogen export limit of 3.6 lb/ac/yr can be met by using one or more of the following strategies: limit the amount of impervious area; treat stormwater runoff to reduce nitrogen; or make payment of offset fees to the North Carolina Wetlands Restoration Fund.

Treatment

Stormwater runoff can be treated to reduce nitrogen using a variety of stormwater Best Management Practices (BMPs), including wet detention ponds, sand filters, water quality swales, buffers, and constructed wetlands. Treatment methods may be used in series if greater removal rates are needed. For BMPs in series, total removal efficiency must be determined by serial calculation. See Table 1 for BMP removal efficiencies.

Offset Fees

Under the offset fee option, the applicant makes a one-time payment of $330 per pound of nitrogen to the North Carolina Wetlands Restoration Fund. Offset fees are allowed for single family and duplex developments when the nitrogen export is between 3.6 and 6.0 lb/ac/yr. For other developments, offset fees are permitted when the nitrogen export is between 3.6 and 10 lb/ac/yr.

If a proposed development would generate more nitrogen, then the stormwater would have to be treated to reduce the nitrogen loading to either 6.0 lb/ac/yr for residential single family and duplex development or 10.0 lb/ac/yr for other development before it would be eligible for the offset payment option.

Based on the 6.0 lb/ac/yr cap for residential development, the maximum offset fee is $792 per acre. The 10 lb/ac/yr cap allows more impervious surface for commercial and other development and this higher cap corresponds to a higher maximum offset fee of $2,112 per acre. The actual offset fee for a given development will vary with the actual calculated nitrogen export.

Applicants must furnish documentation that offset fees have been paid to the North Carolina Wetlands Restoration Fund **before** site plans and subdivisions will be approved. During the development review process the plan drawing and accompanying design and sizing calculations will be reviewed by Stormwater Services. Once the applicant has addressed all plan review comments, the applicant will be notified that the project is conditionally

approved subject to receipt of proof that ofset payment has been made. The conditional approval will indicate the amount of the offset payment that must be made.

Checks should be made out to the "North Carolina Wetland Restoration Fund." The NC Wetland Restoration Program will verify that the amount paid matches the amount specified in the conditional approval, and will send a receipt to both the applicant and the City of Durham normally within five working days, at which time the site plan drawings can be signed and released.

Check may be sent to NC Wetlands Restoration Program, ATTN: Carol Shaw, 1619 Mail Service Center, Raleigh, NC 27699-1619. For FEDEX shipment, the shipping address is 320 West Jones Street, Raleigh, NC 27603 (do not use for USPS mailing as this will slow down delivery.)

OPTIONS FOR CALCULATING NITROGEN EXPORT

Two methodologies are approved for calculating nitrogen loading. The City's Method A and Method B are attached.

Note: Most jurisdictions are using the calculation methods provided in the state's Model Stormwater Program. The City of Durham prepared its own calculation procedure based on monitoring data that has been collected under its NPDES stormwater permit. The North Carolina Environmental Management Commission approved this methodology at its Water Quality Committee meeting on February 7, 2001.

Method A requires that either the building footprints are shown or that the lot's maximum impervious area is indicated on the final plat drawings. Method A may be used with any type of development.

Method B is for ***residential*** development where the actual footprints are not known and may be used for residential subdivisions with up to eight dwelling units per acre. For higher density developments, applicants must show the building footprints or indicate the lot's maximum imperviousness.

In most cases Method A will be used for calculating pre-development loadings. In rare cases a development will take place on agricultural land – which has higher nitrogen loadings than normal managed or unmanaged open space land. In these situations the applicant will need to determine the acreages devoted to pasture land and to cropland. For pasture a loading of 4.4 lbs/ac/year should be used. For cropland a loading of 13.6 lbs/ac/year should be used. Contact Stormwater Services for guidance on calculating nitrogen loading for the pre-development condition where the land is currently being used for agricultural purposes.

Method A: For Quantifying TN Export From Residential/Industrial/Commercial Developments When Footprints Of All Impervious Surfaces Are Shown

The calculations below shall be performed for both the pre-development and post-development site conditions. Speadsheets can be found at: http://www.ci.durham.nc.us/departments/works/divisions/stormwater/design_plan_review.asp#useful

Step 1: Determine area for each type of land use and enter in Column (2).

Step 2: Total the areas for each type of land use and enter at the bottom of Column (2) at "Total Area =."

Step 3: Calculate the fraction of the total area that is impervious area and enter in space provided Column (1).

Step 4: Using the impervious surface fraction in step 3 as "I," calculate (0.43 + 7.7 I) and enter the result in each cell of Column (4).

Step 5: For each row, multiply columns (2), (3) and (4) and enter in Column (5).

Step 6: Sum the rows of column (5) and enter at the bottom as the Total N Loading.

Step 7: Divide the Total N Loading calculated in Step 6 by the total area calculated in Step 2 to determine the Unit Nitrogen Loading in lbs/acre/yr.

(1) Type of Land Cover	(2) Area (acres)	(3) Land Cover Concentration Coefficient	(4) (0.43 + 7.7 I)	(5) Product of Columns (2), (3) and (4)
Impervious surface Fraction of total area: _____ = I		2.60		
Managed open space		1.36		
Undisturbed open space		0.95		
Total Area =		**Total N Loading (lb/yr) =**		
			Unit Nitrogen Loading (lb/acre/yr) =	

Managed open space includes lawns and landscaped areas.

Method B: For Quantifying TN Export From Residential Developments
When Building And Driveway Footprints Are Not Known

The calculations below shall be performed for both the pre-development and post-development site conditions. Speadsheets can be found at: http://www.ci.durham.nc.us/departments/works/divisions/stormwater/design_plan_review.asp#useful

Step 1: Determine area for each type of land use and enter in Column (2).

Step 2: Total the areas for each type of land use and enter at the bottom of Column (2).

Step 3: Determine the TN export coefficient associated with right-of-way using Graph 1 and enter in Column (3).

Step 4: Determine the TN export coefficient associated with lots using Graph 2 and enter in Column (3).

Step 5: Multiply the areas in Column (2) by the TN export coefficients in Column (3) and enter in Column (4).

Step 6: Sum the TN exports for each type of land use and enter the Total N Loading at the bottom of Column (4).

Step 7: Divide the Total N Loading calculated in Step 6 by the total area calculated in Step 2 to determine the Unit Nitrogen Loading in lbs/acre/yr.

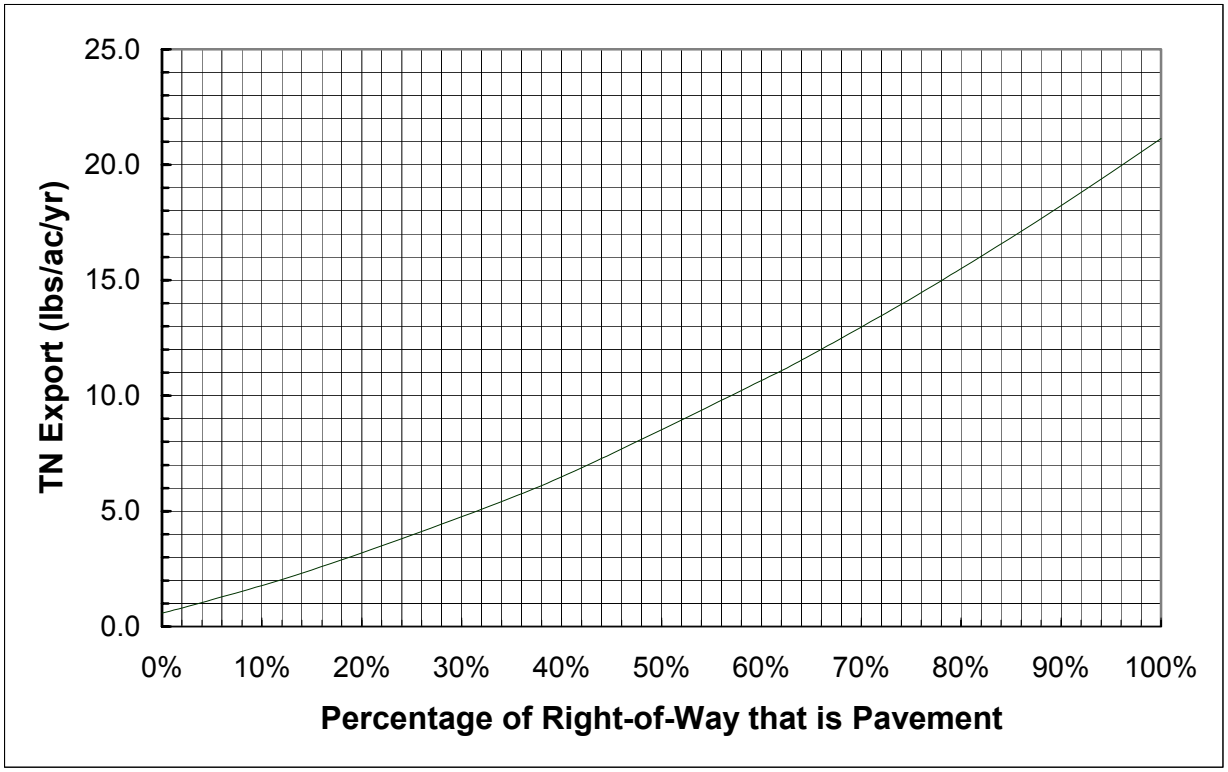
(1) Type of Land Cover	(2) Area (acres)	(3) TN export coeff. (lb/ac/yr)	(4) TN export from use (lb/yr)
Undisturbed open space		**0.41**	
Managed open space		**0.58**	
Right-of-way (read TN export from Graph 1)			
Lots (read TN export from Graph 2)			
TOTAL		**Total N Loading (lb/yr) =**	
		Unit Nitrogen Loading (lb/acre/yr) =	

Right-of-way includes the area dedicated for streets and roads.
In Column (2), the land area should be allocated in the following manner:

- Take the entire area of the development (gross area), and subtract out the right –of-way area to get the "net area." Enter the right-of-way area in column (2).
- There are two options for dealing with the net area remaining after subtracting ROW:
  - Include the common areas, tree save areas, etc. as part of the lots: enter zero for undisturbed and managed open space, and enter the "net area" in the space for lots.
  - Separate the tree save areas, etc. from the lots: enter the appropriate acreage for both undisturbed and managed open space, and subtract these open space acreages from the net area and enter the result in the space for lots in column (2).
- In using graph 2, whatever you end up with as the area for Lots in column (2) should be used to calculate dwelling units per acre: divide the total number of dwelling units by the Lot area in column (2).

Graph 1

Total Nitrogen Export from Right-of-Way



Graph 2

Nitrogen Export from Lots

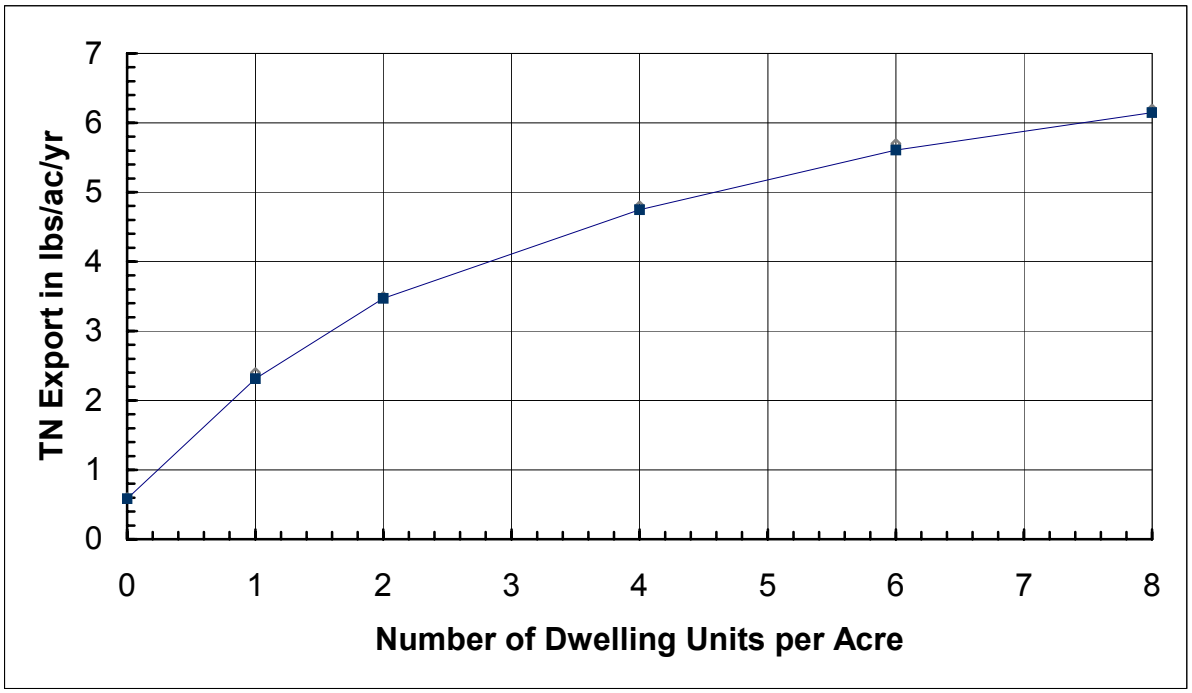


Table 1

BMP Types, TN Removal Rates and Design Standards

BMP Type	Approved TN Removal Rate	Appropriate Design Standards	TSS Removal RATE[2]
Wet detention ponds	25%	NC and MD Design Manuals	85%
Constructed wetlands	40%	NC and MD Design Manuals	85% with ext. detention 35% for pocket wetlands
Open channel practices	30%	NC and MD Design Manuals	35%
Riparian buffers	30%	Neuse Riparian Buffer Rule (15A NCAC 2B .0233)	25-40%
Vegetated filter strips with level spreader	20%	NC and MD Design Manuals and other literature information	25-40%
Bioretention	25%	NC and MD Design Manuals	85%
Bioretention with underdrain	30%	NC and MD Design Manuals	85%
Sand filters[1]	40%	NC and MD Design Manuals, supplemented by City of Durham design standards	85%
Proprietary BMPs	Varies	Per manufacturer subject to DWQ approval	Varies
Other BMPs	Varies	Subject to DWQ approval	Varies

[1] City of Durham allows the use of a sand filter BMP only where the area draining to it is nearly all impervious. Runoff from pervious areas should be directed away from the sand filter.

[2] TSS removal rates are provided for convenience of reader. BMPs may also be required to meet water supply watershed requirements, which requires minimum overall 85% removal rate for TSS.

If BMPs are installed in series on a development site, the overall removal rate shall be determined through serial, rather than additive, calculations.

Example: A water quality swale (open channel practice) is used upstream of a wet detention pond. The respective removal rates for total nitrogen are 30% and 25%. The swale removes 30%. The wet detention pond would then treat the remaining 70% of N that was not removed in the swale. The detention pond removes:

70% x 25% efficiency = 17.5% removed

The total nitrogen removal for these BMPs in series is 30% + 17.5% = 47.5%.

This table may be revised periodically as new BMPs are developed and BMP efficiency studies are completed.

Meeting the Nitrogen Limits

The tables below were prepared as examples of how different development intensities may be able to comply with the nitrogen loading limits. These are likely to be theoretical or best case scenarios because (1) all runoff is assumed to be treated and (2) the land area required for many types of treatment will limit the maximum impervious area. Also, the tables are based on one set of assumptions - other development scenarios may have different outcomes.

RESIDENTIAL DEVELOPMENT

	% Maximum Impervious Surface			
	No Payments to Wetland Fund		With Maximum Allowable Payments* to Wetland Fund	
Residential	All non-impervious surfaces made into lawn	All non-impervious surfaces left undisturbed	All non-impervious surfaces made into lawn	All non-impervious surfaces left undisturbed
Case 1 BMP: none	23.0%	27.8%	37.3%	42.0%
Case 2 BMP: vegetative swale	32.4%	37.3%	50.6%	54.7%
Case 3 BMP: vegetative swale and bioretention (with underdrain), in series	44.4%	48.9%	67.2%	70.2%

* Maximum offset payment is $792 per acre for residential development
6lb/ac/yr - 3.6 lb/ac/yr = 2.4 lb/ac/yr
2.4 lb/ac/yr X $330.00yr/lb = $792/ac

Non-residential Development

	% Maximum Impervious Surface			
	No Payments to Wetland Fund		With Maximum Allowable Payments* to Wetland Fund	
Non-residential	All non-impervious surfaces made into lawn	All non-impervious surfaces left undisturbed	All non-impervious surfaces made into lawn	All non-impervious surfaces left undisturbed
Case 1 BMP: none	23.0%	27.8%	57.4%	61.0%
Case 2 BMP: vegetative swale	32.4%	37.3%	75.5%**	77.8%**
Case 3 BMP: vegetative swale and bioretention (with underdrain), in series	44.4%	48.9%	97.8%**	98.0%**

* Maximum offsite payment is $2,112 per acre for non-residential development
10 lb/ac/yr - 3.6 lb/ac/yr = 6.4 lb/ac/yr
6.4 lb/ac/yr X $330.00yr/lb = $2,112/ac

** Theoretical result - the actual impervious surface must be less to allow space for the selected BMPs.

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SECTION 8.3

STORMWATER BEST MANAGEMENT PRACTICES (BMPS)

This section is intended to provide general information when a stormwater BMP is required. A credit may be available for the City's stormwater service charge in connection with these facilities.

I. General

Stormwater BMPs are of two types, Water Quality Basins and Water Quantity Basins. The Water Quality Basins are required with new developments that exceed impervious area allowed by the low density option in areas of Durham City that are located in designated watersheds. In addition to the Neuse Basin and 2-year and 10-year quantity control requirements, Water Quantity Basins can be required in any area when new development will have an adverse effect on areas that are currently having chronic drainage problems. All Water Quality Basins and Water Quantity Basins shall be located in common open space.

Plans for any stormwater BMP improvement shall be prepared by a Registered Professional Engineer licensed to practice in the State of North Carolina and submitted to the Public Works Department for approval before any work shall begin. In addition, all projects shall also comply with the requirements of the Durham County Sedimentation and Erosion Control Ordinance. The owner shall be responsible for receiving County approval for any project, which is subject to the County's regulations. The work, as it progresses, shall be inspected by the Public Works Director or his/her designated representative to assure completion in accordance with the approved plans.

Storm drainage easements are required for all drainage facilities in new developments. In new developments, the easement shall be shown on the recorded subdivision map or on a recorded map of the property if the development does not constitute a subdivision. Storm drainage easements in new developments shall be centered on the drainage facility shall have a minimum width as specified in Section 8.1 III A and shall not contain or allow the future installation of other parallel utilities such as water lines, sanitary sewer lines, power lines, telephone lines and cable television lines. No structures shall be permitted within these easements.

In the case of new developments, no occupancy of buildings or structures adjoining or adjacent to the drainage facilities shall occur until construction has been completed in accordance with the approved plans and maps dedicating the drainage easements have been recorded. Drainage plans shall be submitted for approval concurrent with the plans for street improvements. Where no street improvements are proposed, the drainage plans shall be submitted concurrent with the site plan.

For maintenance of drainage facilities on private property, see Chapter 23, Section 210-214 of the City Ordinance and the Stormwater Facility Operation and Maintenance Permit Agreement.

II. Water Quality Basins

The Water Quality Basins are required with new developments that exceed the impervious area allowed by the low density option in areas of Durham City that are located in designated watersheds, refer to the Zoning Ordinance for additional information. These structures are to capture the first 1” of runoff and treat it before discharging.

III. Water Quantity Basins

Water Quantity Basins are required in any area of Durham City when new development will have an adverse effect on areas that are currently having chronic drainage problems. These basins are intended to capture rain events of certain magnitude and discharge it at or below the pre-development rate.

It is recommended that the developer contact the Stormwater Services Division to determine if the site in question is in a region of Durham that will require a basin. Some sites will require the Water Quantity Basin because of the 10% rule (refer to Section 8.1 10% Storm Water Rule).

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SECTION 8.4

STORMWATER BMP DESIGN SUMMARIES

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City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Dry Detention Basin Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each water quality/quantity device (wet pond, sand filter, etc.), design calculations, plans and specifications showing basin, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
Tax Map Number: _____ PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal name of owner:_____
Owner contact: _____ Phone #: (____) ____-_____

Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for sw basin property
For projects with multiple basins, specify which pond this worksheet applies to: _____
Detention provided for: ___ 1-year ___ 2-year ___ 10-year ___ other _____

Elevations

Basin bottom elevation	_____	ft.	*(floor of the pond)*
1-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
1-year storm water surface elevation	_____	ft.	
2-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
2-year storm water surface elevation	_____	ft.	
10-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
10-year storm water surface elev.	_____	ft.	
Emergency spillway elevation	_____	ft.	*(invert of emergency spillway)*
Top of embankment/dam	_____	ft.	*(elevation)*
Maximum water surface elevation	_____	ft.	(from max. storm pond can safely pass)
Depth from design storm to Lowest orifice elevation	_____	ft.	

Areas

Design storm surface area	_____	sq. ft.	*(Specify frequency event:_____year)*
Drainage area	_____	ac.	*(on-site and off-site drainage to the pond)*

Volumes

Total Storage volume provided	_____	cu. ft.	*(volume detained at design storm)*

Hydraulic Depth
Volume of design storm divided by surface area of design storm _____ ft.

Discharges (Specify only applicable frequency events 1/2/10)

	1-year	2-year	10-year
Predevelopment	_____ cfs	_____ cfs	_____ cfs
Post-development w/o detention	_____ cfs	_____ cfs	_____ cfs
With detention	_____ cfs	_____ cfs	_____ cfs

Riser/Principal and Emergency Spillway Information

1-year storm orifice/weir	diameter_____ in.	length _____ft.	
2-year storm orifice/weir	diameter_____ in.	length _____ft.	
10-year storm orifice/weir	diameter_____ in.	length _____ft.	
___- year storm orifice/weir	diameter_____ in.	length _____ft.	
Principal spillway	diameter_____ in.		
Emergency spillway	width_____ ft.	side slopes ___:1	slope_____%

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. In the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).
_____ b. The basin side slopes are no steeper than 3:1.
_____ c. Vegetative cover for the basin is specified. No woody vegetation is permitted on the embankment
_____ d. A trash rack or similar device is provided for both the overflow and orifice. Flat top trash racks are not acceptable.
_____ e. A recorded drainage easement is provided for each basin including access to the nearest right-of-way.
_____ f. If the basin is used for sediment and erosion control during construction, a note requiring clean out and vegetative cover being established prior to use as a dry detention basin shall be provided on the construction plan.
_____ g. Anti-floatation calculations are provided for riser structure.
_____ h. A plan view of the pond with grading shown is provided
_____ i. A profile through the forebay, main pond and spillway is provided. Water surface elevations are shown on the profile.
_____ j. Riser structure details are provided.
_____ k. Compaction specifications for the embankment are provided on the plan.
_____ l. A minimum of 10 feet has been provided for the pond embankment top width.

Consideration should be given to the use of anti-seep collars, filter diaphragms, anti-vortex devices, watertight joints, clay core and cutoff trench.

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee ($2,000 per facility) and payment of surety are required prior to construction drawing approval.

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Wet Detention Pond Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a wet detention pond design summary for each pond, design calculations, plans and specifications showing pond, forebay, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
Tax Map Number: _____ PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal name of owner:_____
Owner contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for sw basin property
For projects with multiple basins, specify which pond this worksheet applies to: _____
Does the proposed pond also incorporate stormwater detention? Yes No
Detention provided for: ___ 1-year ___ 2-year ___ 10-year ___ other _____

Elevations

Pond bottom elevation	_____	ft.	*(floor of the pond)*
Permanent pool elevation	_____	ft.	*(invert elevation of the orifice)*
Temporary pool elevation	_____	ft.	*(elevation of the discharge structure overflow)*
1-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
1-year storm water surface elevation	_____	ft.	
2-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
2-year storm water surface elevation	_____	ft.	
10-year storm orifice/weir elevation	_____	ft.	*(invert elevation)*
10-year storm water surface elev.	_____	ft.	
Emergency spillway elevation	_____	ft.	*(invert of emergency spillway)*
Top of embankment/dam	_____	ft.	*(elevation)*
Maximum water surface elevation	_____	ft.	(from max. storm pond can safely pass)
Depth from design storm to Lowest orifice elevation	_____	ft.	

Areas

Permanent pool area provided	_____	sq. ft.	*(water surface area at the orifice elevation)*
Minimum required perm. pool area	_____	sq. ft.	*(calculated surface area required)*
Design storm surface area	_____	sq. ft.	*(Specify frequency event:_____ year)*
Drainage area	_____	ac.	*(on-site and off-site drainage to the pond*

Discharges (Specify only applicable frequency events 1/2/10)

	1-year		2-year		10-year	
Predevelopment	_____	cfs	_____	cfs	_____	cfs
Post-development w/o detention	_____	cfs	_____	cfs	_____	cfs
With detention	_____	cfs	_____	cfs	_____	cfs

Volumes

Permanent pool volume	_____	cu. ft.	*(combined volume of main pond and forebay)*
Temporary pool storage volume	_____	cu. ft.	*(volume detained above the permanent pool)*
Forebay volume	_____	cu. ft.	*(approximately 20% of total volume)*

Hydraulic Depths

Volume of normal pool divided by surface area of normal pool _____ ft.

Volume of temporary pool plus the volume of the normal pool divided by surface area of temporary pool _____ft.

Other parameters

SA/DA[1]	_____		*(from DWQ table)*
Diameter of orifice	_____	in.	*(must provide draw down over 2 to 5 day period)*
Draw-down time	_____	hrs	
Depth of orifice below perm pool	_____	in.	*(orifice inlet depth below permanent pool)*
Design rainfall	_____	in.	
Design TSS removal	_____	%	*(minimum 85% removal required)*

Footnotes:

1. When using the SA/DA tables from the Stormwater Best Management Practices Manual, linear interpolation may be used for values between table entries.)

Riser/Principal and Emergency Spillway Information

1-year storm orifice/weir	diameter_____	in.	length _____	ft.	
2-year storm orifice/weir	diameter_____	in.	length _____	ft.	
10-year storm orifice/weir	diameter_____	in.	length _____	ft.	
___- year storm orifice/weir	diameter_____	in.	length _____	ft.	
Principal spillway	diameter_____	in.			
Emergency spillway	width_____	ft.	side slopes ___:1		slope_____%

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. The permanent pool depth is between 3 and 6 feet (required minimum hydraulic depth of 3 feet)

_____ b. The forebay volume is approximately equal to 20% of the pond volume.

_____ c. The temporary pool controls runoff for water quality design storm.

_____ d. The temporary pool draws down in 2 to 5 days.

_____ e. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).

_____ f. The pond length to width ratio is greater than or equal to 3:1.

_____ g. The pond side slopes above the permanent pool area are no steeper than 3:1.

_____ h. A submerged and vegetated shelf with a slope no greater than 6:1 is provided around the perimeter of the pond (show on plan and profile and provide a vegetation plan).

_____ i. Vegetative cover above the permanent pool elevation is specified. No woody vegetation is permitted on the embankment.

_____ j. A surface baffle, trash rack or similar device is provided for both the overflow and orifice. Flat top trash racks are not acceptable.

_____ k. A recorded drainage easement is provided for each pond including access to the nearest right-of-way.

_____ l. If the basin is used for sediment and erosion control during construction, a note requiring clean out and vegetative cover being established prior to use as a wet detention basin shall be provided on the construction plan.

_____ m. A mechanism is specified which will drain the pond for maintenance and emergencies. Valves used shall be plug valves.

_____ n. Anti-floatation calculations are provided for riser structure.

_____ o. A plan view of the pond with grading shown is provided.

_____ p. A profile through the forebay, main pond and spillway is provided. Water surface elevations are shown on the profile.

_____ q. Riser structure details are provided.

_____ r. Compaction specifications for the embankment are shown on the plan.

_____ s. A minimum of 10 feet has been provided for the pond embankment top width.

Consideration should be given to the use of anti-seep collars, filter diaphragms, anti-vortex devices, watertight joints, clay core and cutoff trench.

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee ($2,000 per facility), and payment of surety are required prior to construction drawing approval.

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City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Sand Filter Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each water quality/quantity device (wet pond, sand filter, etc.), design calculations, and plans and specifications showing sand filter, inlet and outlet structure details.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
Tax Map Number: _____ PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal name of owner:_____
Owner contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for sw basin property
For projects with multiple sand filters, specify which sand filter this worksheet applies to:

Drainage area	_____	ac.	*(on-site and off-site drainage to the pond*
Impervious area	_____	ac.	*(on-site and off-site impervious area draining to sand filter)*
Design rainfall	_____	in.	
Design runoff	_____	in.	
Design treatment volume	_____	cu. ft..	
Design TSS removal	_____	%	*(minimum 85% removal required)*

Sediment chamber design

Bottom elevation	_____	ft.	*(floor of the sediment chamber)*
Weir elevation	_____	ft.	*(invert elevation of overflow weir to sand bed)*
Volume	_____	cu. ft.	*(volume of sediment chamber to weir elevation)*
Surface area	_____	sq. ft.	*(surface area of sediment chamber at bottom of chamber)*

Sand filter bed design

Bottom elevation	_____	ft.	*(elevation of bottom of sand bed)*
Top of sand	_____	ft.	*(elevation of top of sand)*
Sand volume	_____	cu. ft.	*(volume of sand in bed)*
Sand surface area	_____	sq. ft.	*(surface area of sand bed at bottom of bed)*
Perforated pipe length	_____	ft.	*(length of perforated pipe provided under sand bed)*
Dia. of perforated pipe	_____	in..	*(pipe diameter of perforated pipe)*

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. Runoff from landscaped areas and other non-impervious areas has been directed away from the sand filter to the maximum extent practical.
_____ b. Drainage area for sand filter is less than 5 acres.
_____ c. Plan specifies how all slopes draining to the sand filter will be stabilized.
_____ d. No side slopes draining to sand filter greater than 3:1.
_____ e. Design drawings provide note: "All slopes draining to sand filter shall be stabilized per the North Carolina State Erosion and Sediment Control Planning and Design Manual before sand is placed in sand bed."
_____ f. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).
_____ g. A recorded drainage easement is provided for each sand filter including access to the nearest right-of-way.
_____ h. Anti-floatation calculations are provided for riser structure.
_____ i. A surface baffle, trash rack or similar device is provided for both the overflow and orifice. Flat top trash racks are not acceptable.
_____ j. A plan view of the sand filter with grading shown is provided.
_____ k. A profile through the settling chamber, sand bed and spillway is provided. Water surface elevations are shown on the profile.
_____ l. Riser structure details are provided.
_____ m. Compaction specifications for the embankment are provided on the plan.
_____ n. Runoff from storms larger than the 1-year storm are routed around the sand bed.
_____ o. Sand size, type and gradation specified per the North Carolina State BMP manual.

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee ($2,000 per facility), and payment of surety are required prior to construction drawing approval.

City of Durham

Public Works Department

Stormwater Services Divisions

101 City Hall Plaza, Durham, North Carolina, 27701
Telephone (919) 560-4326 FAX (919) 560-4316

Bioretention Area Design Summary

Stormwater Management Construction Plan Review:
A complete stormwater management construction plan submittal includes a design summary for each water quality/quantity device (wet pond, sand filter, bioretention area, etc.), design calculations, plans and specifications showing bioretention area, landscape plan, soil specifications, etc. per the latest edition of the NCDNR Stormwater Best Management Practices manual and the design criteria presented below.

I. PROJECT INFORMATION

Project Name: _____ Phase _____
Tax Map Number: _____ PIN: _____ Case #: _____
Design Contact Person: _____ Phone #: (____) ____-_____
Legal name of owner:_____
Owner contact: _____ Phone #: (____) ____-_____
Owner Address:_____
Deed Book _____Page #_____ or Plat Book _____ Page#_____ for sw basin property
For projects with multiple bioretention areas, specify which bioretention area this worksheet applies to by numbering the bioretention areas (e.g. BA # 1):

Drainage area	_____	ac	*(on-site drainage to the area, 1 acre max *)*
Impervious area	_____	ac	*(on-site impervious area draining to facility)*
Design rainfall	_____	in	
Design runoff	_____	cfs	
Design treatment volume	_____	ft^3	

Bioretention Design

Grass buffer strip width	_____	ft	*(Max slope of 4:1 and minimum width of 10 feet)*
Size of cell area	_____	ft^2	*(Min 5% of drainage area with sand bed, 7% without bed)*
Depth of ponding area	_____	ft	*(6 inches max)*
Width of cell	_____	ft	*(Minimum width of 25 ft)*
Length of cell	_____	ft	*(Minimum length of 2 times the width)*
Inflow sheet flow velocity	_____	ft/s	*(Maximum of 1 ft/s)*
Organic/mulch layer ele.	_____	ft	*(Elevation of top of layer)*
Planting soil top elevation	_____	ft	*(Elevation of top of soil)*
Depth of planting soil	_____	ft	*(Minimum depth of 4 ft)*
Top of sand if applicable	_____	ft	*(Elevation of top of sand)*
Bottom elevation	_____	ft	*(Elevation of bottom of cell)*
Perforated pipe length	_____	ft	*(Length of perforated pipe provided under cell layers)*

* Assuming 100% imperviousness, larger drainage areas may be considered assuming the maximum sheet flow velocity is not exceeded

Space between pipe runs _____ ft *(Spacing between perforated pipe runs, max of 10 ft)*
Longitudinal slope _____ ft *(1% minimum longitudinal slope)*
Diameter of pipe _____ in *(Pipe diameter of perforated pipe, min of 6 inches)*

Emergency Spillway Information

Emergency outlet elev. _____ ft *(invert of emergency overflow weir)*
Emergency spillway width_____ ft. side slopes ___:1 slope_____%

II. REQUIRED ITEMS CHECKLIST

The following checklist outlines design requirements. Initial in the space provided to indicate the following design requirements have been met and supporting documentation is attached.

Applicant's initials

_____ a. Runoff from landscaped areas and other non-impervious areas has been directed away from the bioretention area to the maximum extent practical.
_____ b. Drainage area for bioretention area is less than 1 acre.
_____ c. Plan specifies how all slopes draining to the bioretention area will be stabilized, note that the slopes must be stabilized before installation of the under drain system.
_____ d. Construction sequencing shall be considered and a note added to the plan that states: "All sediment and erosion control practices shall be in place and the slopes draining to the bioretention area shall be stabilized before construction of the bioretention area begins."
_____ e. No side slopes draining to bioretention area greater than 3:1, promote sheet flow through the grass filter strip.
_____ f. Riprap outlet protection, if provided, reduces flow to non-erosive velocities (provide calculations).
_____ g. A recorded drainage easement is provided for each cell including access to the nearest right-of-way.
_____ h. A plan view of the bioretention area with grading shown is provided.
_____ i. A profile through the bioretention area and emergency spillway is provided.
_____ j. Geotextile fabric is placed at the bottom of the excavated cell to prevent soil from getting into the underdrain system.
_____ k. The underdrain system is wrapped in a gravel jacket and a geotextile fabric is placed between the bottom of the sand bed or planting soil and the top of the gravel jacket.
_____ l. The pipe for the underdrain system shall be perforated Schedule 40 PVC.
_____ m. The underdrain system shall connect to the outflow system at a point at least 1 foot inside the bioretention cell wall.
_____ n. A non-perforated piping system is connected to the underdrain piping and extends to the surface of the planting soil for cleanouts.
_____ o. A planting soil mixture specification and a soil characteristics table are provided.
_____ p. Organic/Mulch layer specification is provided.
_____ q. A bioretention area landscape plan is provided including the transport of plant material, preparation of the planting pit, fertilization, installation of the plant material, type and number of plantings (note that there shall be a minimum of three species of trees and three species of shrubs selected to insure diversity, their planting locations, post-installation inspection and maintenance guidelines.

Note: Executed Stormwater Facility Operation and Maintenance Permit Agreement, payment of permit fee ($2,000 per facility), and payment of surety are required prior to construction drawing approval.

SECTION 8.5

FLOOD DAMAGE PROTECTION ORDINANCE

CC adopted 4/15/96

CHAPTER 6

DURHAM N.C. CITY AND COUNTY
FLOOD DAMAGE PROTECTION ORDINANCE

ARTICLE 1: STATUTORY AUTHORIZATION, FINDINGS OF FACT, PURPOSE AND OBJECTIVES

SECTION 6-300: STATUTORY AUTHORIZATION

This ordinance is adopted under the authority of Article 21 Part 6, of Chapter 143; Article 8 of Chapter 160A; Article 19 Part 5 of Chapter 160A; Article 18, of Chapter 153A; and Article 6 of Chapter 153A of the North Carolina General Statutes, and is designed to promote the public health, safety and general welfare of the citizens of the City and County of Durham.

SECTION 6-301: FINDINGS OF FACT

(1) The flood hazard areas [floodway and floodway fringe] of Durham City and County are subject to periodic inundation which results in loss of life, or property, hazards to health and safety, disruption of commerce and governmental services, extraordinary public expenditures of flood protection and relief and impairment of the tax base, all of which adversely affect the public health, safety and general welfare.

(2) These flood losses are caused by the cumulative effect of obstructions in areas of special flood hazard causing increases in flood heights and velocities and by the occupancy in flood hazard areas by uses vulnerable to floods or hazardous to other lands which are inadequately elevated, floodproofed or otherwise unprotected from flood damages.

SECTION 6-302: STATEMENT OF PURPOSE

This ordinance does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding. Larger floods can and will occur and new Flood Hazard Boundary Maps may be adopted over time. This ordinance is imposed to facilitate implementation of the Federal Flood Insurance Program and to minimize the possibility that new construction will sustain damage from flooding. It is the purpose of this ordinance to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

(1) Restrict or prohibit uses which are dangerous to health, safety, and property due to water or erosion hazards or which result in damaging increases in erosion or in flood heights or velocities;

(2) Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

(3) Control the alteration of natural floodplains, stream channels and natural protective barriers which are involved in the accommodation of flood waters;

(4) Control filling, grading, dredging or other development which may increase erosion or flood damage; and,

(5) Prevent or regulate the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands.

SECTION 6-303: OBJECTIVES

The objectives of this ordinance are:

(1) To protect human life and health;

(2) To minimize expenditure of public money for costly flood control projects;

(3) To minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

(4) To minimize prolonged business interruptions;

(5) To minimize damage to public facilities and utilities such as water and gas mains, electric, telephone, sanitary sewer lines, streets and bridges located in areas of special flood hazard;

(6) To help maintain a stable tax base by providing for the sound use and development of areas of flood hazard in such a manner as to minimize flood blight areas; and,

(7) To insure that potential home buyers are notified that property is in an area of flood hazard.

ARTICLE 2: DEFINITIONS

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

"Accessory Structure" means structures which are located on the same parcel of property as the principal structure and the use of which is incidental to the use of the principal structure. With the exception of farm buildings, accessory structures shall not exceed 1,000 square feet or the square footage of the primary structure, whichever is less. Garages, carports and storage sheds are common urban accessory structures. Pole barns, hay sheds and the like qualify as accessory structures on farms and may or may not be located on the same parcel as the farm dwelling or shop building. Accessory structures may not be accessory dwellings. "Addition (to an existing building)" means an extension or increase in the floor area or height of a building or structure. Additions to existing buildings shall comply with the requirements for new construction.

"Appeal" means a request for a review of the local administrator's interpretation of any provision of this ordinance.

"Area of shallow flooding" means a designated AO or VO Zone on a community's Flood Insurance Rate Map (FIRM) with base flood depths from one to three feet, a clearly defined channel does not exist, the path of flooding is unpredictable and indeterminate and velocity flow may be evident.

"Area of special flood hazard" or "Areas of flood hazard" is the land within a community subject to a one percent or greater chance of being flooded in any given year. The boundaries of the areas of special flood hazard are identified as Zone A on the Flood Hazard Boundary Map.

"Base flood" means the flood having a one percent chance of being equaled or exceeded in any given year. C*ommentary: 100 year flood.*

"Basement" means that lowest level or story which has its floor subgrade on at least three sides.

"Breakaway wall" means a wall that is not part of the structural support of the building and is intended through its design and construction to collapse under specific lateral loading forces without causing damage to the elevated portion of the building or the supporting foundation system. A breakaway wall shall have a design safe loading

resistance of not less than 10 and no more than 20 pounds per square foot. A wall with loading resistance of more than 20 pounds per square foot requires a professional engineer or architect's certificate.

"Building" means any structure built for support, shelter or enclosure for any occupancy or storage.

"Development" means any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

"Elevated building" means a non-basement building (a) built, in the case of a building in an area of special flood hazard (Zones A1-A30, AE, A, A99, AO, AH, B, C or X *Commentary: These zones are defined on maps on file in Durham City-County Inspections Department*) to have the top of the elevated floor, above the ground by means of pilings, columns (posts or piers), shear walls parallel to the flow of water and , (b) adequately anchored so as not to impair the structural integrity of the building during a flood up to the magnitude of the base flood. In the case of Zones A1-A30, AE, A, A99, AO, AH, B, C and X, "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of flood waters.

"Exception" is a grant of relief to a persons from the requirements of this ordinance which permits construction in a manner otherwise prohibited by this ordinance where specific enforcement would result in unnecessary hardship. A person, as used in this context, may be an individual, partnership, association, joint venture or corporation.

"Existing manufactured home park or manufactured home subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including, at a minimum, the installation of utilities, the construction of streets and either final site grading or the pouring of concrete pads) was completed before the original adoption of flood damage protection ordinances which occurred in the City of Durham on October 18, 1971 and in Durham County on August 21, 1972.

"Expansion to an existing manufactured home park or subdivision" means the preparation of the additional sites by the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including the installation of utilities, the construction of streets and either final site grading or the pouring of concrete slabs).

"Flood" or "flooding" means a general and temporary condition of partial or complete inundation of normally dry land areas from:

(1) The overflow of inland or tidal waters; and,

(2) The unusual and rapid accumulation of runoff of surface waters from any source.

"Flood Hazard Boundary Map (FHBM)" means an official map of a community, issued by the Federal Emergency Management Agency (FEMA).

"Flood Insurance Rate Map (FIRM)" means an official map on which the Federal Emergency Management Agency has delineated both the areas of special flood hazard and the risk premium zones.

"Flood Insurance Study" is the official report provided by the Federal Emergency Management Agency. The report contains flood profiles, as well as the Flood Boundary Floodway Map and the water surface elevation of the base flood.

"Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

"Floodway Fringe" means the area within the special flood hazard area that has been identified on the Flood Boundary and Floodway Map, which area is adjacent to but not within the Floodway, but is within the 100 year floodplain and is inundated by the base flood.

"Floor" means the finished floor or the top surface of an enclosed area in a building (including basement), i.e., top of slab in concrete slab construction or top of wood flooring in wood frame construction.

"Functionally dependent facility" means a facility which cannot be used for its intended purpose unless it is located or carried out in close proximity to water, such as a docking or port facility necessary for the loading and unloading of cargo or passengers, shipbuilding, ship repair or seafood processing facilities. The term does not include long-term storage, manufacture, sales or service facilities.

"Highest Adjacent Grade" means the highest natural elevation of the ground surface, prior to construction next to the proposed walls of the structure.

"Historic Structure" means any structure that is: (a) list individually in the National Register of Historic Places (a listing maintained by the US Department of Interior) or preliminarily determined by the Secretary of Interior as meeting the requirements for individual listing on the National Register; (b) certified or preliminarily determined by the Secretary of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district; (c) individually listed on a State inventory of historic places; (d) individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified (1) by an approved state program as determined by the Secretary of Interior, or (2) directly by the Secretary of Interior in states without approved programs.

"Levee" means a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control or divert the flow of water so as to provide protection from temporary flooding.

"Levee System" means a flood protection system which consists of a levee, or levees and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices.

"Local Administrator" means the City-County Director of Inspections or the Director's designee.

"Lowest Floor" means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor provided that such an enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of this ordinance.

"Manufactured home" means a structure, transportable in one or more sections, which is built on a permanent chassis and designed to be used with or without a permanent foundation when connected to the required utilities. The term "manufactured home" does not include a "recreational vehicle."

"Manufactured home park or subdivision" means a residential development under single ownership with sites for placement of manufactured homes [manufactured home park]; or a parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale [manufactured home subdivision]. Also included in this definition are the various support facilities for the residents of the development.

"Mean Sea Level" means the average height of the sea for all stages of the tide. It is used as a reference for establishing various elevations within the floodplain. For purposes of this ordinance, the term is synonymous with National Geodetic Vertical Datum (NGVD).

"National Geodetic Vertical Datum (NGVD)" as corrected in 1929 is a vertical control used as a reference for establishing varying elevations within the floodplain as a reference for establishing varying elevations within the floodplain.

"New construction" means structures for which the "start of construction" commenced on or after the adoption of flood damage protection ordinances which occurred in the City of Durham on October 18, 1971 and in Durham County on August 21, 1972 and includes any subsequent improvements to such structures.

"New manufactured home park or subdivision" means a manufactured home park or subdivision for which the construction of facilities for servicing the lots on which the manufactured homes are to be affixed (including at a minimum, the installation of utilities, the construction of streets and either the final site grading or the pouring of concrete slabs) is completed on or after the original adoption of flood damage protection ordinances which occurred in the City of Durham on October 18, 1971 and in Durham County on August 21,1972.

"Nonconforming building or use" mean any legally existing building or use which fails to comply with the provisions of this ordinance.

"Recreational vehicle" means a vehicle which is: (a) built on a single chassis; (b) 400 square feet or less when measured at the largest horizontal projection; (c) designed to be self-propelled or permanently towed by a vehicle; and, (d) designed primarily not for use as a permanent dwelling, but as temporary living quarters for recreational, camping, travel or seasonal use.

"Reference feature" is the receding edge of a bluff or eroding frontal dune or, if such a feature is not present, the normal high-water line or the seaward line of permanent vegetation if high-water line cannot be identified.

"Remedy a violation" means to bring the structure or other development into compliance with State or local floodplain management regulations, or, if this is not possible, to reduce the impacts of its noncompliance. Ways that impacts may be reduced include protecting the structure or other affected development from flood damages, implementing the enforcement provisions of the ordinance or otherwise deterring future similar violations or reducing Federal financial exposure with regard to the structure or other development.

"Start of construction" includes substantial improvement and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, rehabilitation, addition or improvement was within 180 days of the permit date. The actual start means the first placement of permanent construction of a structure (including a manufactured home) on a site, such as the pouring of slabs or footings, installation of piles, construction of columns, or any work beyond the stage of excavation or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation, such as clearing, grading and filling; nor does it include the installation of streets and/or erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor or other structural part of the building, whether or not that alteration affects the external dimensions of the building.

"Structure" means a walled and roofed building, a manufactured home, including a gas or liquid storage tank, or other man-made facilities or infrastructures that are principally above ground.

"Substantial damage" means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. See definition of "substantial improvement."

"Substantial Improvement" means any repair, reconstruction, rehabilitation, addition or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage", regardless of the actual repair work performed. The term does not, however, include either: (1) any project or improvement of a structure to correct existing violations of State or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions; or, (2) any alteration of a historic structure, provided that the alteration will not preclude the structure's continued designation as an historic structure.

"Substantially improved existing manufactured home park or subdivision" means where the repair, reconstruction, rehabilitation or improvement of the streets, utilities and pads equals or exceeds 50 percent of the value of the streets, utilities and pads before the repair, reconstruction or improvement commenced.

"Violation" means the failure of a structure or other development to be fully compliant with the community's floodplain management regulations. A structure or other development without the elevation certificate, other certifications or other evidence of compliance required in Articles 4 and 5 is presumed to be in violation until such time as that documentation is provided.

ARTICLE 3: GENERAL PROVISIONS SECTION

SECTION 6-304: LANDS TO WHICH THIS ORDINANCE APPLIES

This ordinance shall apply to all areas of special flood hazard within Durham City and County.

SECTION 6-305: BASIS FOR ESTABLISHING THE AREAS OF SPECIAL FLOOD HAZARD

The areas of special flood hazard identified by the Federal Emergency Management Agency in its Flood Insurance Study, dated 1995, with accompanying maps and other supporting data and any revision thereto are adopted by reference and declared to be a part of this ordinance. When base flood elevation data or floodway data have not been provided in accordance with Article 3, Section 6-305, the local administrator may require HEC 2 or other engineering studies, or may obtain, review and reasonably utilize any base flood elevation data and floodway data available from a Federal, State or other source.

SECTION 6-306: PERMITTING SYSTEM

All development activities shall conform with the permitting provisions of this ordinance, the zoning ordinance and all other ordinances prior to their commencement.

SECTION 6-307: COMPLIANCE

No structure shall hereafter be located, extended, converted or structurally altered and no land shall be disturbed without full compliance with the terms of this ordinance and other applicable regulations.

SECTION 6-308: ABROGATION AND GREATER RESTRICTIONS.

This ordinance is not intended to repeal, abrogate or impair any existing easements, covenants or deed restrictions. However, where this ordinance and another conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

SECTION 6-309: INTERPRETATION

In the interpretation and application of this ordinance all provisions shall be: (1) considered as minimum requirements; (2) liberally construed in favor of the governing body; and, (3) deemed neither to limit nor repeal any other powers granted under state statutes.

SECTION 6-310: WARNING AND DISCLAIMER OF LIABILITY

The degree of flood protection required by this ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering consideration. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damages. This ordinance shall not create liability on the part of Durham City or County or by any officer or employee thereof for any flood damages that result from reliance on this ordinance or any administrative decision lawfully made hereunder.

SECTION 6-311: PENALTIES FOR VIOLATION

Violation of the provisions of this ordinance or failure to comply with any of its requirements shall constitute a misdemeanor, with penalties of fines or imprisonment or both. Each day such violation continues shall be considered a separate offense. Violations for failure to remove an improvement shall be calculated under NCGS 143-215.58 (b). Nothing herein shall prevent Durham City or County from taking such other lawful action, including civil and equitable enforcement as is necessary to prevent or remedy any violation. In particular, enforcement may be as authorized by common law or by any or all of the statutory remedies described in NCGS Chapter 160A, Sections 175, 365, and 421 through 425. NCGS Chapter 153A, Sections 123 and 324, and 361 through 364 and NCGS 143-215.58. Violations that violate both this chapter and the Zoning Ordinance are also subject to the enforcement provisions of the Zoning Ordinance.

ARTICLE 4: ADMINISTRATION

SECTION 6-312: DESIGNATION OF LOCAL ADMINISTRATOR

The City-County Director of Inspections or the Director's designees are hereby appointed to administer and implement the provisions of this ordinance.

SECTION 6-313: PERMIT APPLICATIONS FOR DEVELOPMENT ACTIVITIES (INCLUDING BUT NOT LIMITED TO: BUILDING PERMITS, SITE PLANS AND SUBDIVISION PLATS)

Applications for development activities, including but not limited to land disturbing permits, building permits, site plans and subdivision plats, shall be submitted in conformance with normal submittal procedures. Applications for property located within an area of special flood hazard as mapped by the Federal Emergency Management Agency or identified pursuant to Article 5 Section 6-318 shall also submit:

(1) A plot plan that shows the base flood elevation contour or 100-year floodplain or a statement that the entire lot or property is within the area of special flood hazard. The plan must be prepared by or under the direct supervision of a registered land surveyor or professional engineer registered in North Carolina. The plan shall also show existing and proposed contours based on an actual field survey.

(2) The plan required by Article 4, Section 6-313 must show the floodway, if any, as identified by the Federal Emergency Management Agency, Article 3 Section 6-305 or Article 5, Section 6-319.

(3) Where base flood elevation data are provided as set forth in Article 3 Section 6-305, the application shall show:

(a) The elevation (in relation to mean sea level) of the lowest floor (including basement) of any new and substantially improved structures, and

(b) In the case of building permits, if the structure has been floodproofed in accordance with Article 4, Section 6-315 (9), the elevation (in relation to mean sea level) to with Article 4, Section 6-315 (9), the elevation (in relation to mean sea level) to which the structure was floodproofed.

(4) Where the base flood elevation data are not provided, the applications must show construction of the lowest floor at least 2 feet above the highest adjacent grade.

(5) Where any watercourse will be altered or relocated as a result of a proposed development, applications shall include: a description of the extent of watercourse alteration or relocation; an engineering report on the effects of the proposed project on the flood-carrying capacity of the watercourse and the effects to properties located both upstream and downstream and a map showing the location of the proposed watercourse alteration or relocation.

(6) When through an exception approved by the DRB, the applicant shall provide a certificate from a N.C. registered professional engineer or architect that the non-residential floodproofed structure meets the floodproofing criteria in Article 4, Section 6-315 (9).

(7) A flood elevation certification is required after the lowest floor is completed. Within twenty-one (21) calendar days of establishment of the lowest floor elevation, it shall be the duty of the permit holder to submit to the local administrator a completed elevation certificate, using FEMA's National Flood Insurance Program Elevation Certificate showing that the lowest floor, or floodproofed elevation, whichever is applicable, as built, in relation to mean sea level. Said certification shall be prepared by or under the direct supervision of a registered land surveyor or professional engineer registered in North Carolina and certified by same. Any work done within the twenty-one (21) day calendar period and prior to submission of the certification shall be at the permit holder's risk. The local administrator shall review the floor elevation survey data submitted. Deficiencies detected by such review shall be corrected by the permit holder immediately and prior to further progressive work being permitted to proceed. Failure to submit the survey or failure to make said corrections required hereby shall be cause to issue a stop-work order for the project.

(8) Augmentation of Standards for Subdivision Proposals: All subdivision proposals in flood prone areas shall be consistent with the need to minimize flood damage; in conjunction with the other requirements of this Section and Article 5 Section 6-316, all subdivision proposals in flood prone areas, shall have public utilities and facilities such as water and sanitary sewer systems located and constructed to minimize flood damage; all subdivision proposals in flood prone areas shall have adequate drainage provided [in accordance with Durham and NCDOT standards] to reduce exposure to flood hazards; and, base flood elevation data [if available] including floodway, flood fringe and 100-year flood elevation shall be shown on all subdivision proposals in flood prone areas.

SECTION 6-314: ADMINISTRATIVE PROCEDURES

(1) Inspections of Work in Progress: As the work pursuant to a permit progresses, the local administrator shall make as many inspections of the work as may be necessary to ensure that the work is being done according to the provisions of the local ordinance and the terms of the permit. In exercising this power, the administrator has a right, upon presentation of proper credentials, to enter on any premises within the territorial jurisdiction at any reasonable hour for the purposes of inspection or other enforcement action.

(2) Stop Work Orders: Whenever a building or part thereof is being constructed, reconstructed, altered or repaired in violation of this ordinance, the administrator may order the work to be immediately stopped. The stop work order shall be in writing and directed to the person doing the work. The stop work order shall state the specific work to be stopped, the specific reasons for the stoppage and the conditions under which the work may be resumed. Violation of a stop work order constitutes a misdemeanor.

(3) Revocation of Permits: The local administrator may revoke and require the return of a permit by notifying the permit holder in writing stating the reason for the revocation. Permits shall be revoked for any substantial departure from the approved application, plans or specifications; for refusal or failure to comply with the requirements of State or local laws; or for false statements or misrepresentations made in securing the permit. Any permit mistakenly issued in violation of an applicable State or local law may also be revoked.

(4) Periodic Inspections: The local administrator and each member of the inspections department shall have a right, upon presentation of proper credentials, to enter on any premises within the territorial jurisdiction of the department at any reasonable hour for the purposes of inspection or other enforcement action.

(5) Violations to be Corrected: When the local administrator notifies the owner or occupant of the building of a violation, the owner or occupant shall immediately remedy each of the violations.

(6) Actions in Event of Failure to Take Corrective Action: If the owner of a building or property shall fail to take prompt corrective action, the administrator shall give a written notice, by personal service or by certified or registered mail to the last known address:

(a) That the building or property is in violation of the Flood Damage Protection Ordinance;

(b) That a hearing will be held before the local administrator at a designated place and time, not later than 10 days after the date of the notice, at which time the owner shall be entitled to be heard in person or by counsel and to present arguments and evidence pertaining to the matter; and,

(c) That following the hearing, the local administrator may issue such order to alter, vacate or demolish the building; or to remove fill as appears appropriate.

(7) Order to Take Corrective Action: If, upon a hearing held pursuant to the notice prescribed above, the administrator shall find that the building or development is in violation of the Flood Damage Protection Ordinance, the administrator shall make an order in writing to the owner, requiring the owner to remedy the violation within such period, not less than 60 days, the administrator may prescribe; provided that where the administrator finds that there is imminent danger to life or other property, corrective action may be taken in such lesser period as may be feasible.

(8) Appeal: Any owner who has received an order to take corrective action may appeal from the order to the Development Review Board (DRB) as established by the Durham Zoning Ordinance and the Durham Subdivision Ordinance by giving notice of appeal in writing to the administrator within 10 days following issuance of the final order. In the absence of an appeal, the order of the administrator shall be final. The DRB shall hear an appeal within a reasonable time and may affirm, modify and affirm or revoke the order.

(9) Failure to Comply with Order: If the owner of a building or property fails to comply with an order to take corrective action from which no appeal has been taken or fails to comply with an order of the DRB following an appeal, the owner shall be guilty of a misdemeanor and shall be punished at the discretion of the Court. In addition, the owner shall be subject to civil enforcement as described in Article 3, Section 6-311.

SECTION 6-315: PROCEDURES FOR DETERMINING EXCEPTIONS TO THE REQUIREMENTS

(1) The Durham Development Review Board (DRB) as established by the Durham Zoning Ordinance and the Durham Subdivision Ordinance shall hear and decide requests for exceptions to these requirements. Any exceptions made shall require compliance with the conditions of Section D (8), below.

(2) Any person aggrieved by the decision of the DRB or any taxpayer may appeal such decision to the Court, as provided in Chapter 7A of the North Carolina General Statutes.

(3) Exceptions to the requirements may be allowed for the repair or rehabilitation of historic structures in areas of special flood hazards upon the determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as an historic structure and the modification is the minimum necessary to preserve the historic character and design of the structure.

(4) In deciding upon such applications, the DRB shall consider all technical evaluations, all relevant factors, all standards specified in other sections of this ordinance, and:

(a) The danger that materials may be swept onto other lands to the injury of others;

(b) The danger to life and property due to flooding or erosion damage;
(c) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;

(d) The importance of the services provided by the proposed facility to the community;

(e) The necessity to the facility of a waterfront location, where applicable;

(f) The availability of alternative locations, not subject to flooding or erosion damage, for the proposed use;

(g) The compatibility of the proposed use with existing and anticipated development;

(h) The relationship of the proposed use to the comprehensive plan and floodplain management program for that area;

(i) The safety of access to the property in times of flood for ordinary and emergency vehicles;
(j) The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site; and,

(k) The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sanitary sewer, gas, electrical and water systems and streets and bridges.

(5) The findings listed above shall be submitted to the DRB, in writing and included in the permanent record of the decision.

(6) Upon consideration of the factors listed above and the purposes of this ordinance, the DRB may attach such conditions as it deems necessary to further the purposes of this ordinance.

(7) Exceptions shall not be allowed within any designated floodway if any increase in flood levels during the base flood discharge would result.

(8) Required Conditions:

(a) Exceptions may not be made when the modification will make the structure in violation of other Federal, State, or local laws, regulations or ordinances.
(b) Exceptions shall only be made upon a determination that the modification is the minimum necessary, considering the flood hazard, to afford relief.

(c) Exceptions shall only be issued upon (i) a showing of good and sufficient cause; (ii) a determination that failure to grant the exceptions would result in unusual hardship to the owner of the property that was not caused, in whole or in major part, by the property owner and, (iii) a determination that the exception will not result in increased flood heights, additional threats to public safety, extraordinary public expense, create nuisance, cause fraud on or victimization of the public or conflict with existing local laws or ordinances.

(d) Any applicant to whom an exception is allowed shall be given written notice specifying the difference between the base flood elevation and the elevation to which the structure is to be built and a written statement that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation. Such notification shall be maintained with a record of all such exceptions.

(e) The local administrator shall maintain the records of all appeal actions and report any actions to the Federal Emergency Management Agency upon request.

(9) If any exception is made by the DRB to allow structures to be floodproofed in lieu of elevation, the structure shall be subject to the following standards:

(a) All areas of the structure below the required elevation shall be watertight with walls substantially impermeable to the passage of water.

(b) The structural components shall have the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy.

(c) A North Carolina registered professional engineer or architect shall certify that these standards are satisfied.

ARTICLE 5: PROVISIONS FOR FLOOD HAZARD REDUCTION

SECTION 6-316: GENERAL STANDARDS

Development and land disturbing activity in floodway and floodway fringe are regulated by the Durham Zoning Ordinance, Section 11, Natural Resource Protection Standards in addition to the Durham, NC Flood Damage Protection Ordinance. Where development is allowed by the Durham Zoning Ordinance, the following provisions are required in all areas of special flood hazard:

(1) All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure;

(2) All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage;

(3) All new construction or substantial improvements shall be constructed by methods and practices that minimize flood damages;

(4) Electrical, heating, ventilation, plumbing, air conditioning equipment and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.

(5) All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system;

(6) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters;

(7) On-site waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding; and,

(8) Any alteration, repair, reconstruction or improvements to a structure which is in compliance with the provisions of this ordinance, shall meet the requirements of "new construction" as contained in this ordinance.

(9) Non-Conforming Buildings or Uses. Non-conforming buildings or uses may not be enlarged, replaced or rebuilt.

(10) Fill material shall be used for all new construction and substantial improvements to create an elevation that is two feet above base flood elevation. The fill material shall be required to extend for a distance of 40 feet from the exterior walls of a building. Where the distance to the property line is less than 40 feet, the fill shall extend to the property line. The required fill material distance shall include a sloped edge with a maximum 3:1 slope [for example, for a fill 3 feet deep: 31 feet of flat fill + 9 feet of sloped fill] or a retaining wall in lieu of the slope [for example, a side yard of flat fill and a retaining wall]. Residential accessory structures which are defined as non-habitable structures by the North Carolina Building Code are exempt from requirements to extend the fill material away from the base but are required to be placed on fill which is two feet above base flood elevation. Exceptions from any of these requirements resulting from special stormwater considerations shall be forwarded to the DRB as described in Article 4, Section 6-315, only with a recommendation from the Engineer's office.

SECTION 6-317: SPECIFIC STANDARDS FOR DEVELOPMENT IN THE FLOODWAY FRINGE

In all areas of special flood hazard where base flood elevation data have been provided, as set forth in Article 3, Section 6-305 and delineated as floodway fringe, the following standards for development must be met in addition to the requirements associated with the zoning designation of the property:

(1) Residential Construction. New construction or substantial improvement of any residential structure [See (3) for information on manufactured homes] shall have the lowest floor, including basement, elevated no lower than two feet above the base flood elevation.

(2) Nonresidential Construction. New construction or substantial improvement of any commercial, industrial or non-residential structure shall have the lowest floor, including basement, elevated no lower than two feet above the level of the base flood elevation.

(3) Manufactured Homes

(a) Manufactured homes that are placed or substantially improved on sites (i) outside a manufactured home park or subdivision; (ii) in a new manufactured home park or subdivision; (iii) in an expansion to an existing manufactured home park or subdivision; or, (iv) in an existing manufactured home park or subdivision on which a manufactured home has incurred "substantial damage" as the result of a flood, must be on a permanent foundation such that the lowest floor of the manufactured home is no lower than two feet above the base flood elevation.

(b) Manufactured homes that are to be placed or substantially improved on sites in an existing manufactured home park or subdivision that are not subject to the provisions of Article 5, Section 6-317 (3a) of this ordinance must be elevated so that the lowest floor of the manufactured home is no lower than two feet above the base flood elevation.

(c) Manufactured homes shall be anchored to prevent flotation, collapse or lateral movement. For the purpose of this requirement, manufactured homes must be anchored to resist flotation, collapse or lateral movement in accordance with the ***Regulations for Mobile Homes and Modular Housing*** adopted by the Commissioner of Insurance pursuant to NCGS 143.143.15.

(d) An evacuation plan must be developed for evacuation of all residents of all new, substantially improved or substantially damaged manufactured home parks or subdivisions located within areas of special flood hazard. This plan shall be filed with the local administrator and the local Emergency Management coordinator at the time of site plan approval or subdivision plat approval. If site plan or subdivision approval is not required, the plan shall be filed for approval prior to issuance of a building permit.

(4) Recreational Vehicles. Recreational vehicles shall either:

(a) Be on site for fewer than 180 consecutive days and be fully licensed and ready for highway use. A recreational vehicle is ready for highway use if it is on wheels or jacking system, is attached to the site only by quick-disconnect type utilities and security devices and has no permanently attached additions; or

(b) Meet the requirements of Article 4, Section 6-313 and Article 5, Sections 6-316 and 6-317 (3).

(5) Temporary Structures. Prior to the issuance of a permit for a temporary structure, the following requirements must be met:

(a) All applicants must submit to the local administrator prior to the issuance of a permit, a plan for the removal of such structure(s) in the event of a hurricane or flash flood warning notification. The plan must include the following information:

(i) A specified time period for which the temporary use will be permitted;
(ii) The name, address and phone number of the individual responsible for the removal of the temporary structure;

(iii) The time frame prior to the event at which a structure will be removed (i.e. minimum of 72 hours before landfall of a hurricane or immediately upon flood warning notification);

(iv) A copy of the contract or other suitable instrument with a trucking company to insure the availability of removal equipment when needed; and

(v) Designation, accompanied by documentation of a location outside the area of special flood hazard to which the temporary structure will be moved.

(b) The above information shall be submitted in writing to the local administrator for review and written approval.

(6) Accessory Structures. When accessory structures, as defined in this section are to be placed in areas of special flood hazard the following criteria shall be met:

(a) Accessory structures shall not be accessory dwellings and shall not be used for human habitation (including working, sleeping, living, cooking or rest room areas);

(b) Accessory structures shall be designed to have low flood damage potential;

(c) Accessory structures shall be constructed and placed on the building site so as to offer the minimum resistance to the flow of floodwaters;

(d) Accessory structures shall be firmly anchored in accordance with Article 5, Section 6-316 (1);

(e) Service facilities such as electrical and heating equipment shall be installed in accordance with Article 5 Section 6-316 (4).

(7) All construction shall comply with the applicable flood hazards reduction provisions of Article 5. Non-conformities are subject to the requirements of Article 5, Section 6-316 (9).

SECTION 6-318: SPECIFIC STANDARDS FOR DEVELOPMENT IN FLOODWAYS

Located within areas of special flood hazard established in Article 3, Section 6-305, are areas designated as floodways. The floodway is an extremely hazardous area due to the velocity of flood waters which carry debris and potential projectiles and which have erosion potential. The following provisions shall apply within such areas:

(1) Restricted uses in floodways: Only those uses permitted by the zoning ordinance and listed below may be placed on those portions of a property located within the floodway and the uses shall be subject to the following additional requirements:

(a). The following uses, when permitted by the zoning ordinance, are allowed to locate within floodways without certification by a professional engineer regarding resulting changes in flood levels during a base flood:

(i). General farming, pasture, outdoor plant nurseries, horticulture, forestry, wildlife sanctuary, game farm and other similar agricultural uses or wildlife uses.

(ii). Loading areas, parking areas, aircraft landing areas and other similar industrial-commercial uses.

(iii). Lawns, gardens, parking, play areas, and other similar uses.

(iv). Golf courses, tennis courts, driving ranges, archery ranges, picnic grounds, parks and other similar private and public recreational uses.

(b). The following uses, when permitted by the zoning ordinance, may be allowed to locate within floodways if certification by a professional engineer registered in North Carolina is provided to the approving authority that no increase in flood levels during a base flood will result:

(i). Railroads, streets, bridges, culverts, creeks, and storm drainage facilities, sanitary sewage or water treatment plant outlets, water supply intake structures and other public, community or utility uses.

(ii). Marinas, boat rentals, docks or piers.

(iii). Pilings or other columns used for support.

(iv). Dams, provided that any person proposing the construction of a dam shall provide documentation prepared by a professional engineer registered in North Carolina that such a dam will not cause the inundation of any land not owned by the person constructing the dam and any existing structures on lands owned by the person constructing the dam and proof that all required Federal and State permits for the dam have been obtained.

(2) No encroachments into the floodway shall be permitted unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice and prepared by a professional engineer registered in North Carolina that the proposed encroachment would not result in any increase in the flood levels during the occurrence of the base flood. Such certification and technical data shall be presented to the local administrator.

(3) If Article 5, Sections 6-318 (1 & 2) are satisfied, construction shall comply with any applicable flood hazards reduction provisions of Article 5. Nonconformities are subject to the requirements of Article 5, Section 6-316 (9).

SECTION 6-319: STANDARDS FOR STREAMS WITHOUT ESTABLISHED BASE FLOOD ELEVATIONS AND/OR FLOODWAYS

Located within the areas of special flood hazard established in Article 3, Section 6-305, are small streams where no base flood data has been provided or where no floodways have been identified. The following provisions apply within such areas.

(1) No encroachments, including fill, new construction, substantial improvements or new development shall be permitted within the setback distance established by the stream buffer overlay district or the watershed protection overlay district of the Durham Zoning Ordinance or twenty feet each side from top of bank, which ever is greater.

(2) If Article 5, Section 6-319 (1) is satisfied and base flood elevation data is available from other sources, all new construction and substantial improvements within such areas shall comply with all applicable flood hazard reduction provisions of Article 5 and shall be elevated with elevations established in accordance with Article 3, Section 6-305. When base flood elevation data are not available from a Federal, State or other source, the lowest floor, including basement, shall be elevated at least two feet above the highest adjacent grade.

ARTICLE 6: LEGAL STATUS PROVISIONS

SECTION 6-320: EFFECT ON RIGHTS AND LIABILITIES UNDER THE EXISTING FLOOD DAMAGE PROTECTION ORDINANCE

This Ordinance in part comes forward by re-enactment of some of the provisions of the flood damage protection ordinance enacted in the City of Durham on October 18, 1971 and in Durham County on August 21, 1972, as amended and subsequently re-enacted by Durham City and County on December 31, 1993 (Durham City-County Zoning Ordinance Section 11),and it is not the intention to repeal but rather to re-enact and continue to enforce without interruption of such existing provisions, so that all rights and liabilities that have accrued thereunder are reserved and may be enforced. The enactment of this ordinance shall not affect any action, suit or proceeding instituted or pending. All provisions of the flood damage protection ordinance section of the Durham City and County zoning ordinance enacted on December 31, 1993, as amended, which are not reenacted herein are repealed.

SECTION 6-321: EFFECT UPON OUTSTANDING BUILDING PERMITS

Nothing herein contained shall require any change in the plans, construction, size or designated use of any building, structure or part thereof for which a building permit has been granted by the Inspections Director or authorized agents of the Director before the time of passage of this ordinance; provided, however, that when construction is not begun under such outstanding permit within a period of six months subsequent to passage of this ordinance, construction or use shall be in conformity with the provisions of this ordinance.

SECTION 6-322: EFFECTIVE DATE

This ordinance shall become effective upon adoption.

SECTION 6-323: ADOPTION CERTIFICATION

I hereby certify that this is a true and correct copy of the flood damage protection ordinance as adopted by the Durham City Council on the _____day of _____199____.

WITNESS my hand and official seal of _____, this the_____ day of _____, 199____.

To reach Durham City/County Planning call 919-560-4137 or fax us at 919-560-4641.

Recent Change to the Code of Federal Regulations:

Per 44CFR 60.3 (a)(3)(iv), if a proposed building site is in a flood-prone area, all new construction and substantial improvements shall be constructed with electrical, heating, ventilation, plumbing, air conditioning equipment and other service facilities are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding. This includes ductwork. If ductwork is to be floodproofed to meet this requirement, it must be certified by a registered professional engineer or architect, using FEMA Form 81-65. While this form is titled for non-residential structures, you may accept it for floodproofing of ductwork only for residential structures.

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SECTION 9.0

STREETS

This section is intended to provide design criteria for construction plans. The Transportation Division is responsible for reviewing and approving the general design layout of traffic flow patterns. Refer to Section 10 Transportation for questions concerning traffic flow, turn lanes, proposed pavement width, etc.

The City and the County of Durham have adopted street standards for public and private streets. The Table of Minimum Design Requirements for Public and Private Residential Streets (PDF format - Acrobat Reader required) identifies the standard design criteria for street size and capacity and typical cross sections. In general all streets are designed according to their usage and proposed traffic volume and the City of Durham Street Construction Specifications.

When a project involves or is adjacent to an existing street, an investigation should be made as to the current maintenance of that street. Information on streets maintained by the City of Durham is listed in the Powell Bill, found at http://www.ci.durham.nc.us/departments/works/divisions/engineering/powell_bill.pdf.

I. General

1. All street construction, public and private, will conform to the requirements listed in Section 2.1 Construction Plan Approval Process.
2. The Engineer shall provide a pavement design that shall be based on projected traffic volumes and percentage of trucks. All pavement design to be a minimum 2-1/2" I-2, 8" ABC or equivalent unless it is a Commercial/Industrial Road, Collector or Thoroughfares then it shall be a minimum of 2" I-2, 2" HB, 8" ABC. Traffic characteristics or soil conditions may dictate increased stronger pavement section in any case.
3. Superelevated curves are not used on residential streets except by special approval.
4. Reverse Curves-horizontal
   a. For design speeds of 25 MPH or less will require a minimum of 25 feet of tangent on residential streets
   b. For design speeds greater than 25 MPH will require a minimum of 50' of tangent on residential streets.
5. No PCCs (point of compound curve) will be allowed.
6. On residential and non-residential streets, cul-de-sacs shall have a minimum 37-foot to back of curb roadway radii, 35-foot back of curb throat radii, 46-foot right-of-way radius, and 26-foot right of way throat radii (24" curb and gutter section). For a 30" curb and gutter section cul-de-sacs shall have a minimum 37.5-foot to back of curb roadway radii, 34.5-foot back of curb throat radii, 46.5-foot right-of-way radius, and 25.5-foot right of way throat radii.
7. All storm drainage to conform to current City of Durham standards and policy.
8. Street signage along public streets and on private streets/drives will be the responsibility of the of the entity(ies) responsible for the development and placed according to the standards of the City of Durham and NCDOT, as applicable(see Section 10.0 Transportation). The street signage on public streets will be maintained by the entity(ies) of the development up to the time when the street is accepted by the City of Durham or NCDOT, as applicable. The street signage for private streets will be maintained by the entity(ies) of the development. All signage shall conform to MUTCD (Manual on Uniform Traffic Control Devices) Standards.
9. Anticipated street classification, traffic volume, design speed, sight distances and other relevant standards shall govern horizontal and vertical curves and roadway alignment.
10. Intersections shall intersect at 90 degrees with minimum of 70 degrees (only on a case by case review).
11. Desirable maximum profile grade is 10%. Minimum desirable grade is 1%.

12. Grades should not exceed 3% for the first 300 feet from the centerline of any publicly maintained road for a residential collector/non-residential street. Grades should not exceed 5% for the first 100 feet from the centerline of any publicly maintained road for a residential street.
13. The use of a grade break, in lieu of a vertical curve, will be allowed only when the algebraic difference in the road grades is 0.80 or less.
14. Desirable curb radii for all intersecting streets are 30 feet with a minimum radius of 25 feet. Nonresidential and collectors require larger radii.
15. Plans for all widening shall show that the contractor will saw and remove the top 1 1/2" of existing pavement a minimum of 12" from the edge, or as directed by the city, and place new pavement over the existing base. This may include additional surfacing up to full width of road as directed by the Department of Public Works.
16. Curb and gutter and roll curb shall be City of Durham standard (see Durham Street Specifications). NCDOT median curb is accepted for medians and islands. Roll curb shall transition to standard curb at all radii, catch basins, fire hydrants, and as directed by the Engineering inspector during construction.
17. ABC stone (Road Base) to extend under curb and gutter and terminate 6 inches beyond back of curb.
18. At all non-residential driveways, a 48-inch valley gutter is to be used unless an approved street type driveway intersection is approved. Minimum radii for all non-residential driveways will be 10'. Increased radii maybe required depending upon the project (Greater than 500 ADT will require a minimum 25' radius driveway)
19. Where streets terminate (example Phase lines) the following will be installed:
    a. Asphalt header
    b. Riprap or concrete apron for storm water to dissipate.
    c. Utilities to extend a minimum of 5' beyond the edge of pavement.
    d. NCDOT type III barricade.
20. On projects involving irrigation systems within median areas, underdrain pipe shall be installed as follows:
    a. Starting at a roadway low point, install a minimum of 100 lineal feet in both directions from the low point, along both sides of the median.
    b. Along a section of road with "pickup" basins, a minimum of 100 lineal feet on the uphill side of the basins, on both sides of the median.
    c. At the downhill end of the median, if the end is not at a low point.

    If during construction, a situation arises where water is coming from somewhere and there is a chance that the water could cause problems with the road, utilities or sidewalks, etc., additional underdrain will be required to drain the area.

    The underdrain shall be directed to discharge into a drainage structure. No underdrain pipe shall cross roadway. Junction boxes and catch basins shall be added along median to intercept the underdrain as needed.
21. At a location where a wide street with curb and gutter tapers in to match a narrower street, without curb and gutter, the curb and gutter shall not follow the taper. The distance between the ends of the curb and gutter shall be the width of the wider pavement area.
22. Temporary turnarounds are required when the street stub length is equal to or greater than 150 feet from the centerline of the intersection to the end of the stub or if there are 6 lots or more located adjacent to the street stub. A temporary cul-de-sac, built to permanent cul-de-sac standards, are required when the street stub length is equal to or greater than 300 feet from the centerline of the intersection to the end of the stub or if there are 10 lots or more located adjacent to the street stub.
23. At stream crossings, the road must be built to the full City of Durham cross-section.
24. For acceptable K values for vertical curves, refer to the latest edition of the AASHTO publication entitled "A Policy on Geometric Design of Highways and Streets (Green Book)."
25. For projects involving signalized intersection(s), an electronic copy of the approved construction drawings are to be submitted to the Traffic Operations Engineer, Transportation Division. Contact Transportation Division regarding submittal process. Submittals to take place only after Construction Drawings are approved.

26. At all road stubs to adjacent properties where required by the Public Works Department, the consultant shall provide all requested future street profiles for review and approval.

II. Construction

1. Refer to Section 2.1 Construction Plan Approval Process.
2. Immediately following placement and acceptance of the stone base, the 1 1/2" of I-2 asphalt shall be installed. Placement of the final 1" of I-2 shall occur within 1 year following the placement of the 1 1/2" of I-2 or near the full build-out of the dwelling units. Items within the pavement, such as valve boxes, manhole frames and covers, catch basin frames and grates, etc, shall be set to final road elevations prior to placement of the initial 1 1/2" of I-2. To prevent damage to these items during the delay of the final I-2 placement, additional asphalt shall be "feathered" in around them.
3. All subgrade material shall be compacted to 95% standard proctor. The stone base shall be compacted to 100% standard proctor.
4. All driveway entrances must meet City of Durham standards or as subsequently amended or meet NCDOT if the driveways are located on the State Highway System. Permits are required before construction on both City and State roads (see Section 3 Permitting).
5. All work must carry a one-year warranty from the date of City's acceptance on materials and workmanship including damages from settlement.
6. Construction standards shall meet City of Durham Engineering Division's standards and specifications and N. C. Department of Transportation Standard Specifications for Roads and Structures, as revised 2002, (and as subsequently amended) and AASHTO's "A Policy on Geometric Design of Highways and Streets, 4th Edition" (2001), except where standards in these Guidelines are more stringent.

TABLE OF MINIMUM DESIGN REQUIREMENTS FOR PUBLIC AND PRIVATE RESIDENTIAL STREETS

Commercial, Office, Industrial Development will be reviewed separately.

See also INGRESS/EGRESS requirements of the Durham Zoning Ordinance for use limits (Section 8.1.13)

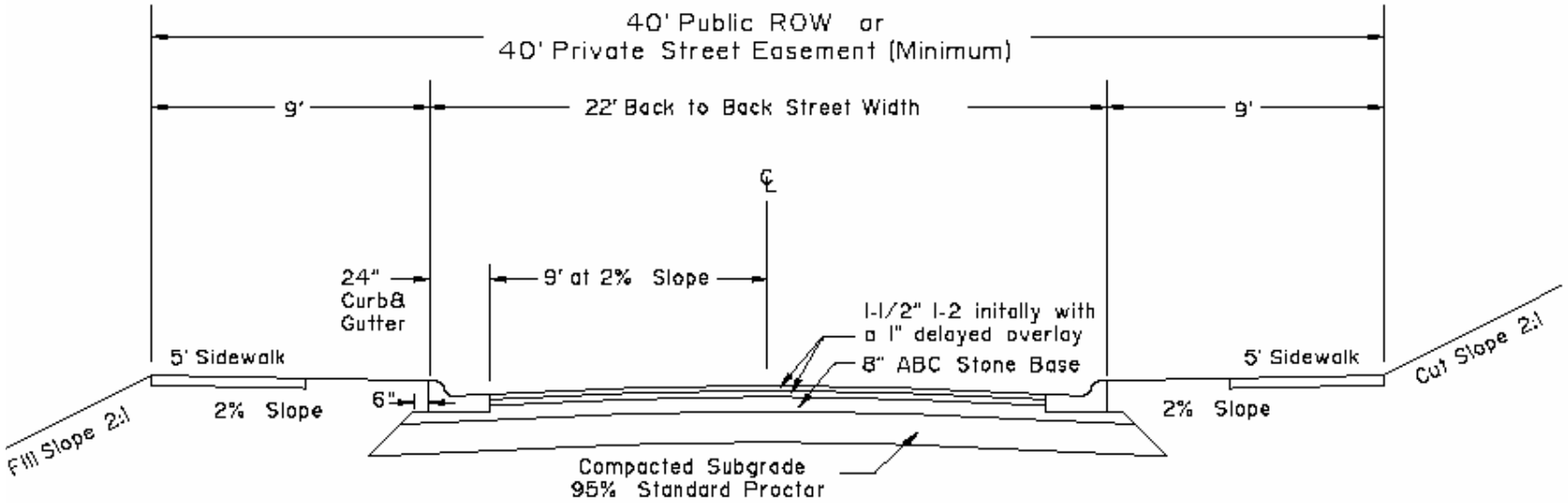
Street Type	Maintenance: Public	Maintenance: Private	Speed Limit	Total Pavement Width: With Curb (See note #1)	Total Pavement Width: Without Curb (Edge to Edge)	Public ROW Width (See note #2 & #3 below)	Private Street Easement (Minimum Widths)	Pavement (See note #4 below)	Units Served	Vehicle Volume (Average Daily Traffic)	Design Speed Vertical (Min.)	Centerline Radius	Corner Radii
ALLEY *Limited use-secondary access to lot* *No mailboxes abutting alley.*	Public *Must tie into public street.*	Private	10 MPH	N/A	12'	20'	20'	3" ABC + 6" Concrete *Inverted crown*	Case by case.	Case by case.	Case by case.	35' *or ability to negociate turn.*	N/A
RESIDENTIAL LIMITED Same if adding parking bays.	Public		10 MPH	22'	22' *plus 6' shoulders*	WITH Curb = 40' WITHOUT Curb =60'		8" ABC+11/2",1" *or equal* *See note #6*	Up to 15. *20 with 2 or more outlets.*	< 150 ADT	25 MPH	50'	10'
RESIDENTIAL LIMITED Same if adding parking bays.		Private	10 MPH	22'	22' *plus 6' shoulders*		WITH Curb = 40' BAY = As needed to include bay WITHOUT Curb = 60'	8" ABC+11/2",1" *or equal* *See note #6*	Up to 15.	< 150 ADT	25 MPH	50'	10'
RESIDENTIAL STREET Same if adding parking bays.	Public		15 MPH	24'	22' *plus 6' shoulders*	WITH Curb = 40' WITHOUT Curb =60'		8" ABC+11/2",1" *or equal* *See note #6*	Up to 25	< 250 ADT	25 MPH	100'	20'
RESIDENTIAL STREET Same if adding parking bays.		Private	15 MPH	24'	22' *plus 6' shoulders*		WITH Curb = 40' BAY = As needed to include bay WITHOUT Curb = 60'	8" ABC+11/2",1" *or equal* *See note #6*	Up to 25	< 250 ADT	25 MPH	100'	20'
RESIDENTIAL LOCAL STREET (No Parking) See note #4 RESIDENTIAL LOCAL STREET (With Parking)	Public		25 MPH	26' 32'	22' *plus 8' shoulders*	WITH Curb=50' WITHOUT Curb =70'		8" ABC+11/2",1" *or equal* *See note #6*	Up to 100	< 1000 ADT	25 MPH	181'	20'
RESIDENTIAL LOCAL STREET (No Parking) See note #4 RESIDENTIAL LOCAL STREET (With Parking)		Private	25 MPH	26' 32'	22' *plus 8' shoulders*		WITH Curb = 50' WITHOUT Curb =70'	8" ABC+11/2",1" *or equal* *See note #6*	Up to 100	< 1000 ADT	25 MPH	181'	20'
RESIDENTIAL MAJOR LOCAL STREET (No Parking) See note #4 RESIDENTIAL MAJOR LOCAL STREET (With Parking)	Public		30 MPH	26' 32'	22' *plus 8' shoulders*	WITH Curb=50' WITHOUT Curb =70'		8" ABC+11/2",1" *or equal* *See note #6*	100-250	1000-2500 ADT	30 MPH	300'	25'
RESIDENTIAL MAJOR LOCAL STREET (No Parking) See note #4 RESIDENTIAL MAJOR LOCAL STREET (With Parking)		Private	30 MPH	26' 32'	22' *plus 8' shoulders*		WITH Curb = 50' WITHOUT Curb =70'	8" ABC+11/2",1" *or equal* *See note #6*	100-250	1000-2500 ADT	30 MPH	300'	25'
COLLECTOR (No Parking) *See note #4*	Public	Private	35 MPH	41'	N/A	WITH Curb = 60'	WITH Curb = 60'	To be designed	250-400	2500-4000 ADT	35 MPH	480'	30'
MINOR THOROUGHFARES	To be determined by the City.												
MAJOR THOROUGHFARES	To be determined by the City.												
FREEWAYS	To be determined by the City.												

General Notes

1. a. Dimensions are based upon using a 24" upright curb and gutter section measuring from Back of Curb to Back of Curb (BC/BC). The COLLECTOR has a 30" upright curb and gutter.
   b. 30" roll curb can be used as a substitute for the 24" C&G on RESIDENTIAL LIMITED, RESIDENTIAL STREET and RESIDENTIAL LOCAL STREET but add 1' to the BC\BC dimension, and reduce treelawn by 0.5' each.
   c. Roll curb can not be used as a substitute for the RESIDENTIAL MAJOR LOCAL and COLLECTOR.
2. No above ground utility structures within the Street ROW or Public Street Easement unless approved by Engineering Department.
3. The pavement structure design may increase depending upon soil conditions and/or projected traffic volumes.
4. Street sections designed for 'No Parking' shall have signs installed at the developer's expense indicating no parking zones as required by the City.
5. Landscaping and improvements are allowed within the Street ROW or Public Street Easements only by approval of the City or NCDOT.
6. 1 1/2" I-2 to be installed immediately following ABC placement. 1" I-2 placement to be delayed until 6 months after the placement of the 1 1/2" of I-2.

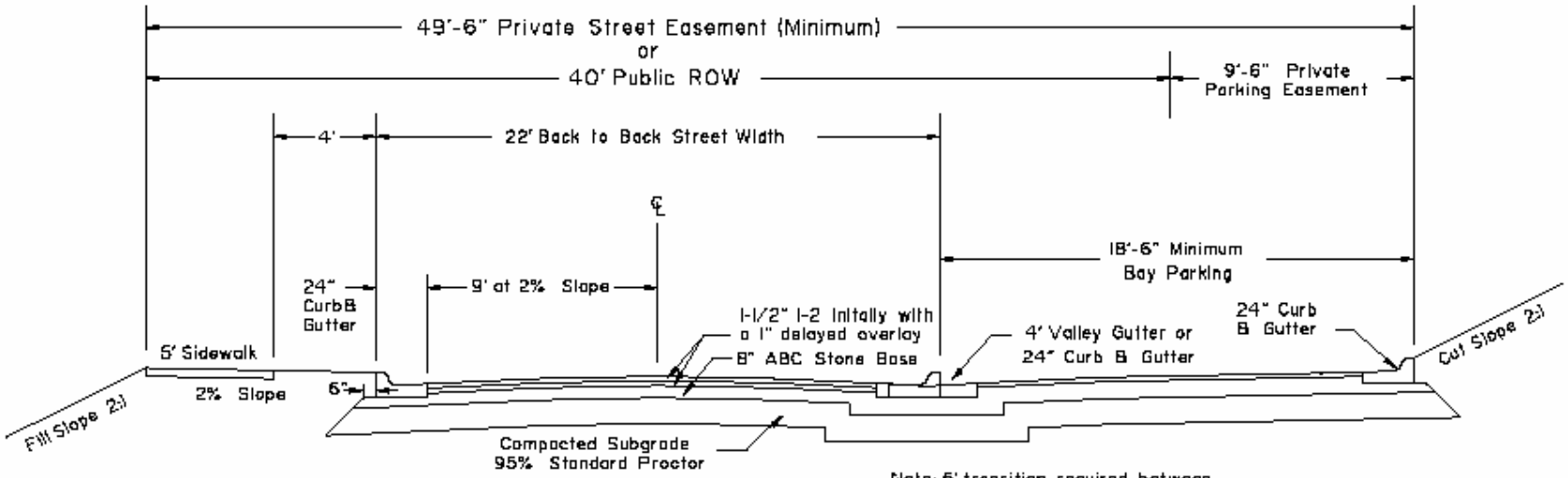
Revision Date; Sept , 2000

RESIDENTIAL LIMITED STREET WITH CURB



Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

RESIDENTIAL LIMITED STREET WITH CURB & BAY PARKING

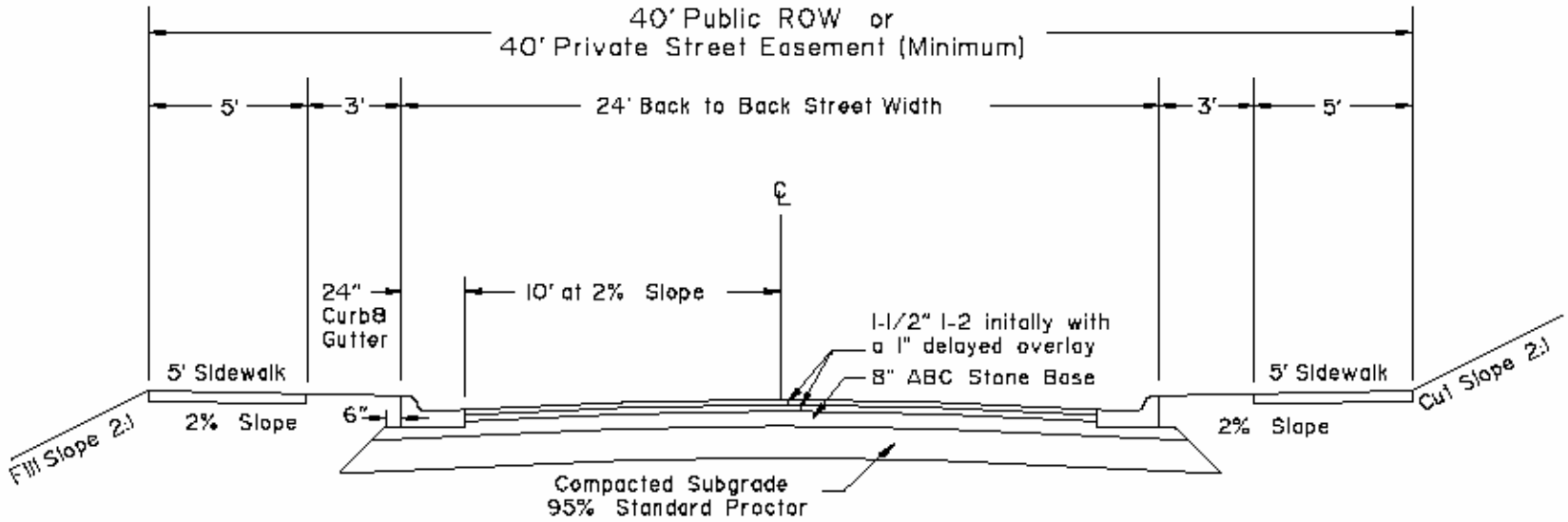


Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

Note: 5' transition required between curb and gutter and valley gutter

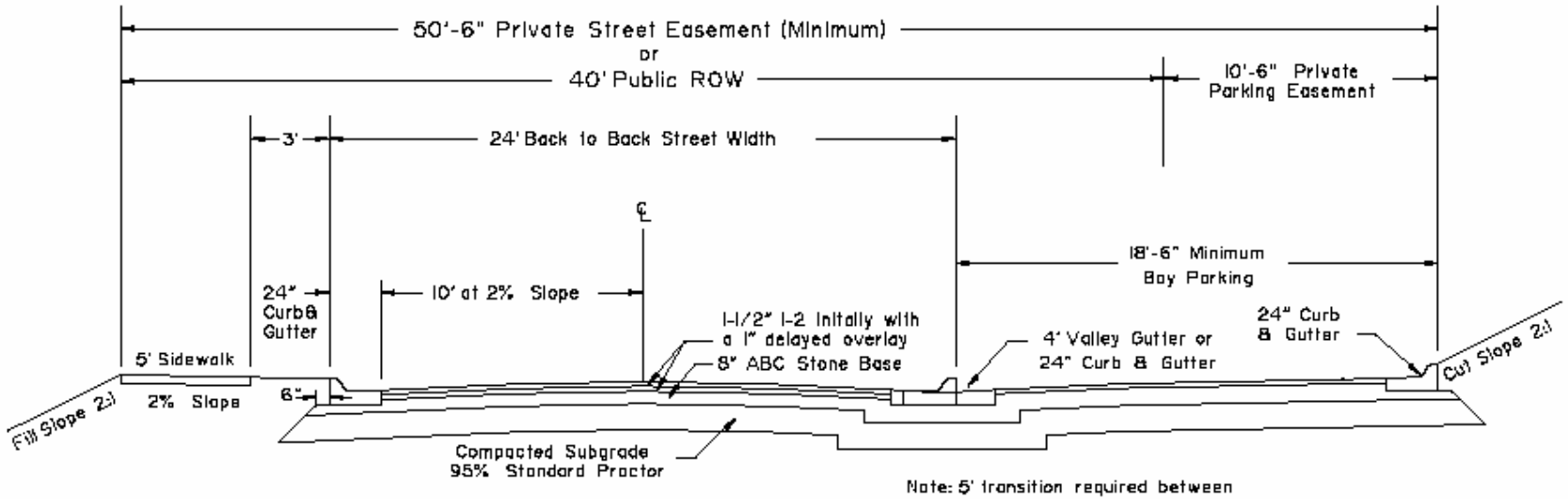
Note: Bays are located on one side of the street only. Bays may alternate from one side of the street to the other, but cannot be located on both sides of the street at any one location.

RESIDENTIAL STREET WITH CURB



Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

RESIDENTIAL STREET WITH CURB & BAY PARKING

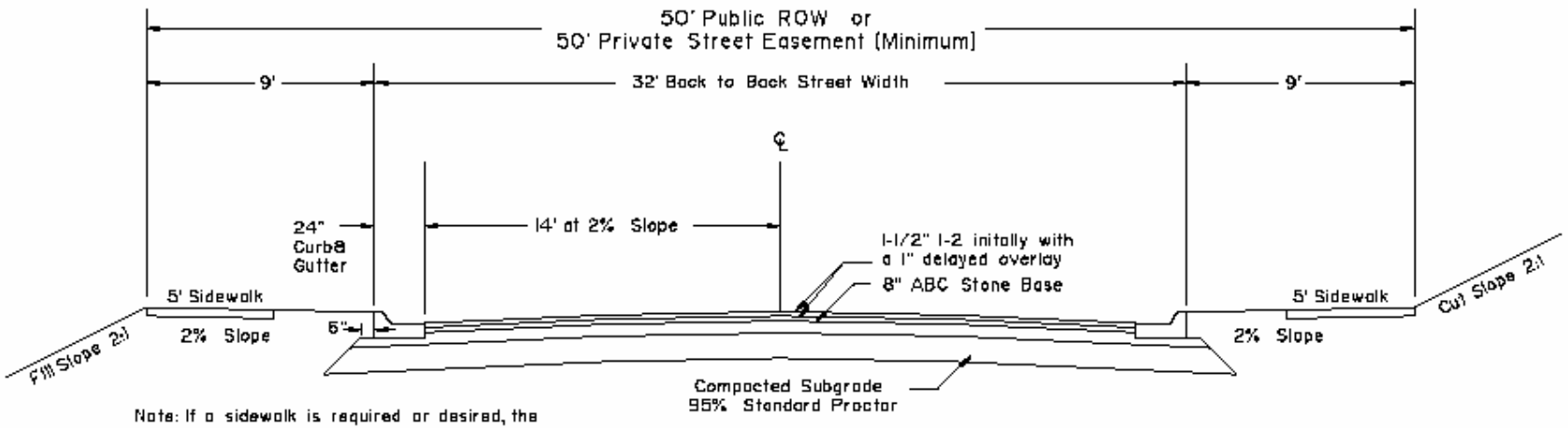


Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

Note: Bays are located on one side of the street only. Bays may alternate from one side of the street to the other, but cannot be located on both sides of the street at any one location.

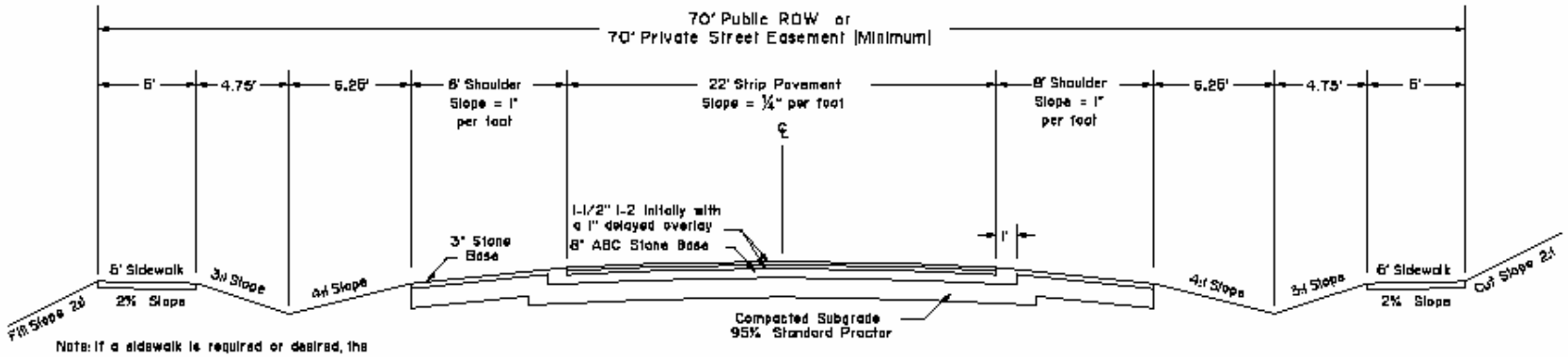
Note: 5' transition required between curb and gutter and valley gutter

RESIDENTIAL LOCAL STREET WITH CURB WITH PARKING



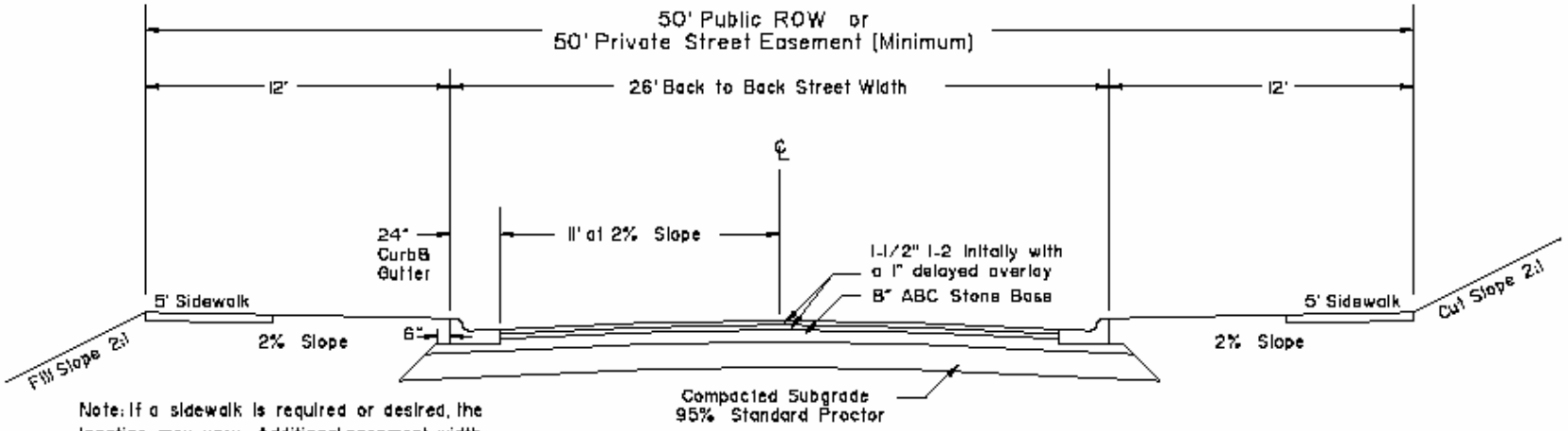
Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

RESIDENTIAL LOCAL STREET WITHOUT CURB



Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

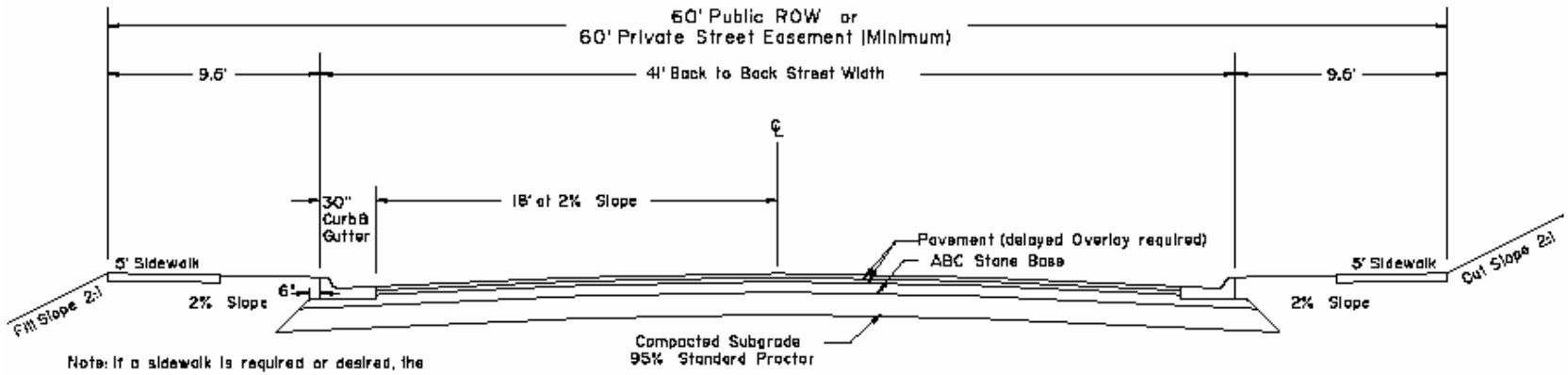
RESIDENTIAL MAJOR LOCAL STREET W/ CURB
& RESIDENTIAL LOCAL STREET WITH CURB



Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

Note: Roll Curb not acceptable in this section

COLLECTOR

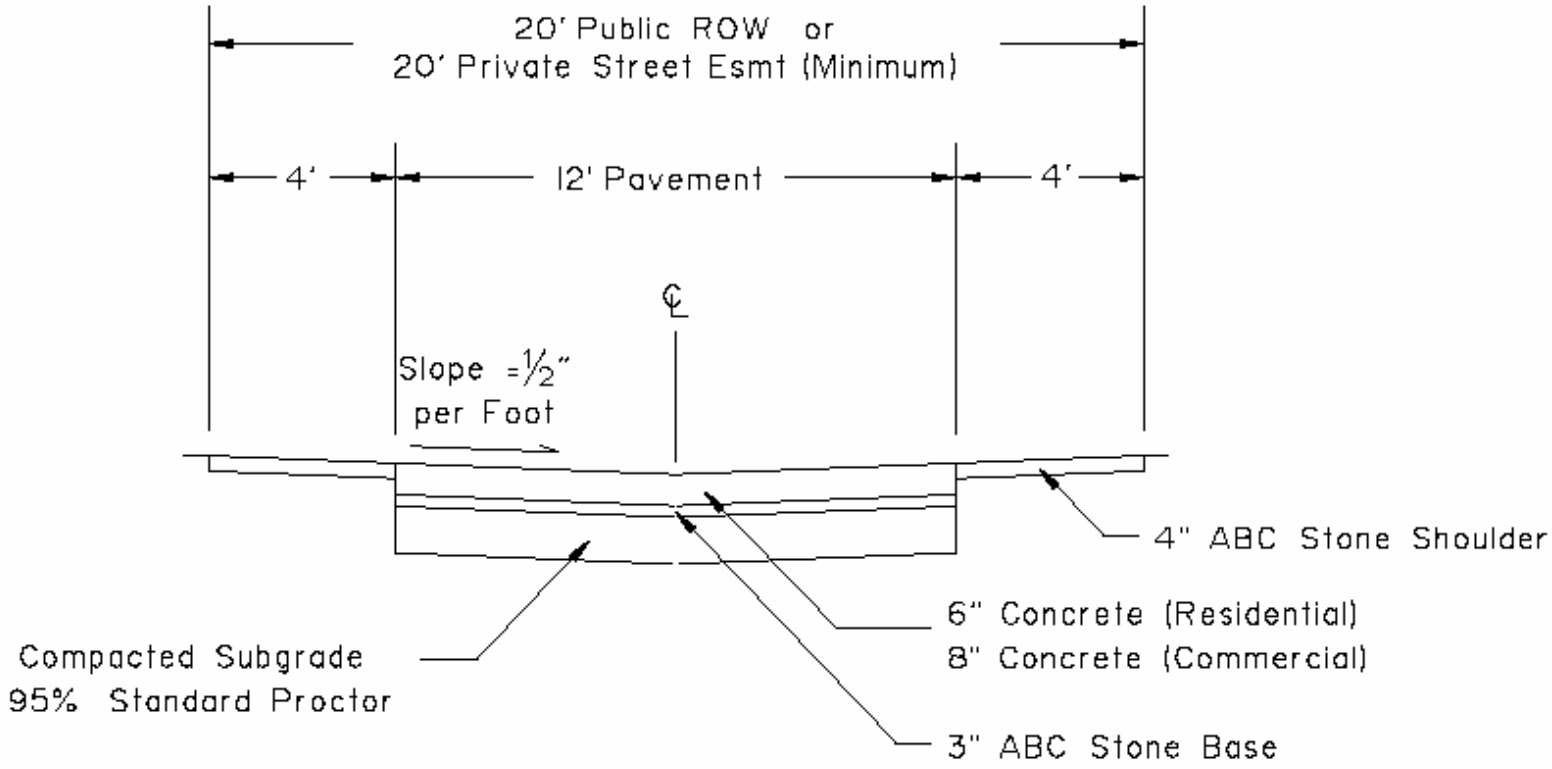


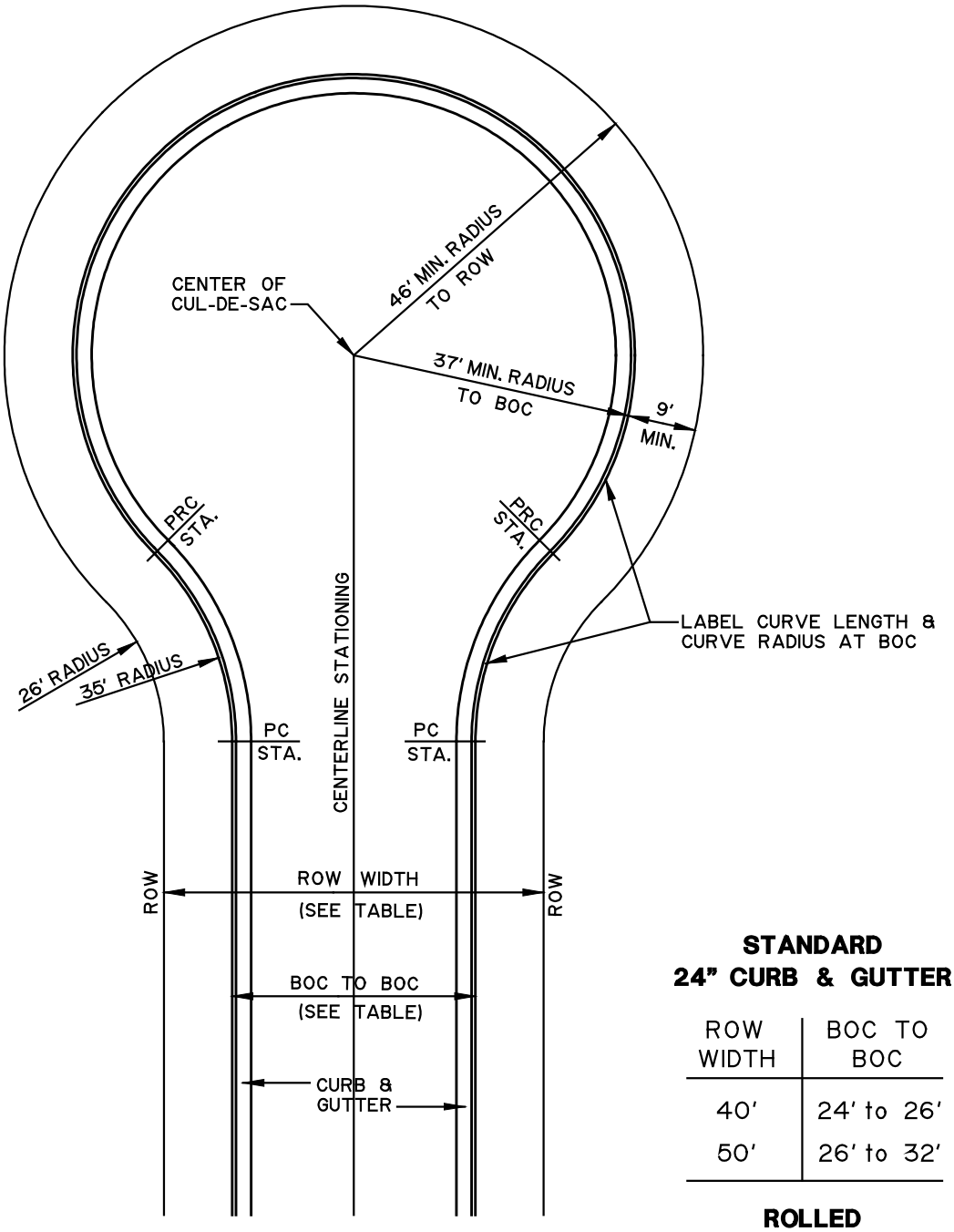
Note: If a sidewalk is required or desired, the location may vary. Additional easement width may be required. See Sidewalk Ordinance.

Note: Depths of pavement and stone base to be determined on a case by case basis.

Note: Roll Curb not acceptable in this section

ALLEY


20' Public ROW or
20' Private Street Esmt (Minimum)
4'
12' Pavement
4'
℄
Slope =½"
per Foot
4" ABC Stone Shoulder
6" Concrete (Residential)
8" Concrete (Commercial)
Compacted Subgrade
95% Standard Proctor
3" ABC Stone Base



STANDARD
24" CURB & GUTTER

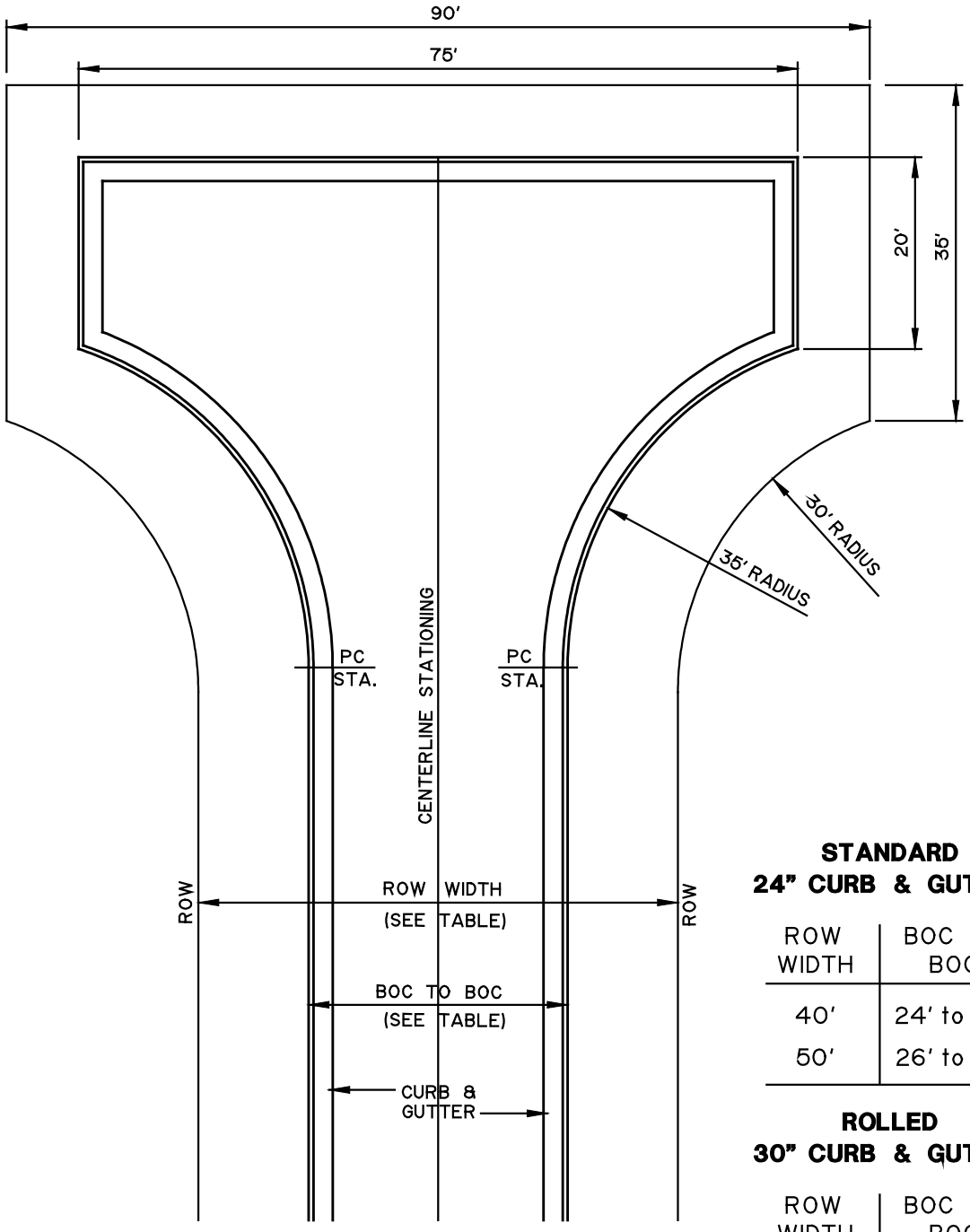
ROW WIDTH	BOC TO BOC
40'	24' to 26'
50'	26' to 32'

ROLLED
30" CURB & GUTTER

ROW WIDTH	BOC TO BOC
40'	23' to 25'

DURHAM
1869
CITY OF MEDICINE

DATE: AUG. 2003	**RESIDENTIAL CUL-DE-SAC WITH CURB & GUTTER**	**SCALE:** NONE
REVISED:	**CITY OF DURHAM, NORTH CAROLINA DEPARTMENT OF PUBLIC WORKS**	**DETAIL NO.** ST-12



STANDARD
24" CURB & GUTTER

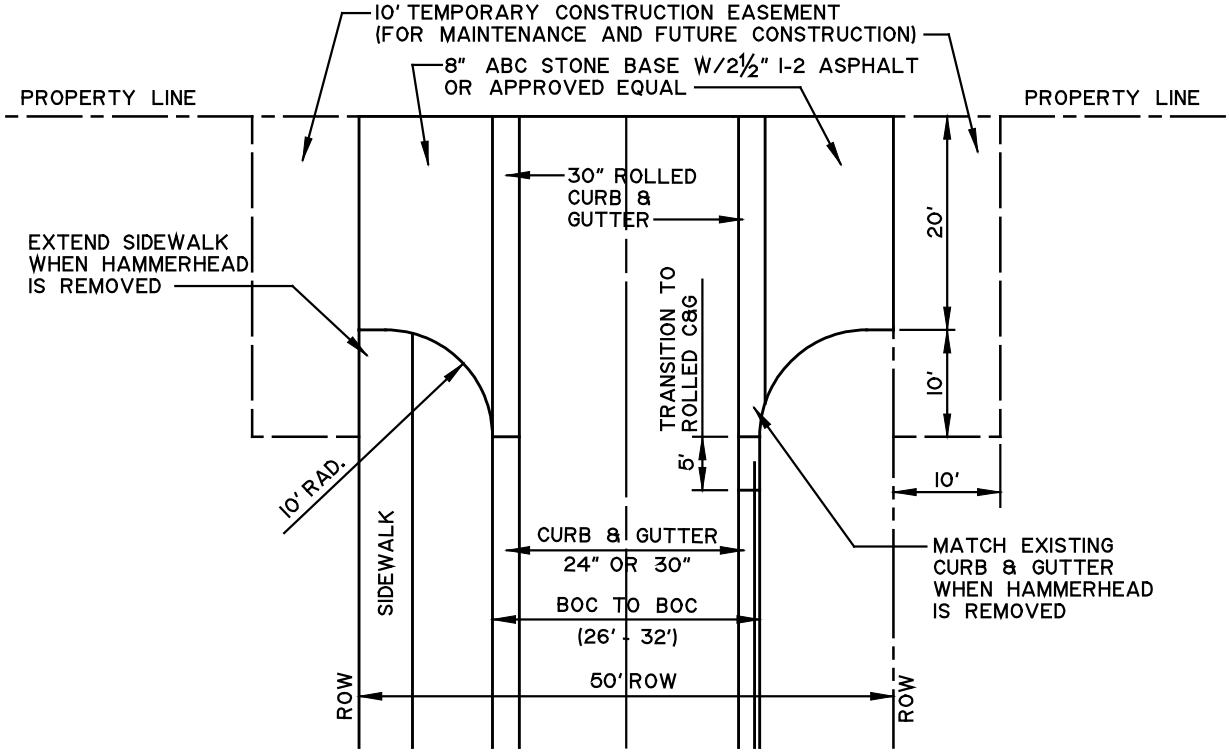
ROW WIDTH	BOC TO BOC
40'	24' to 26'
50'	26' to 32'

ROLLED
30" CURB & GUTTER

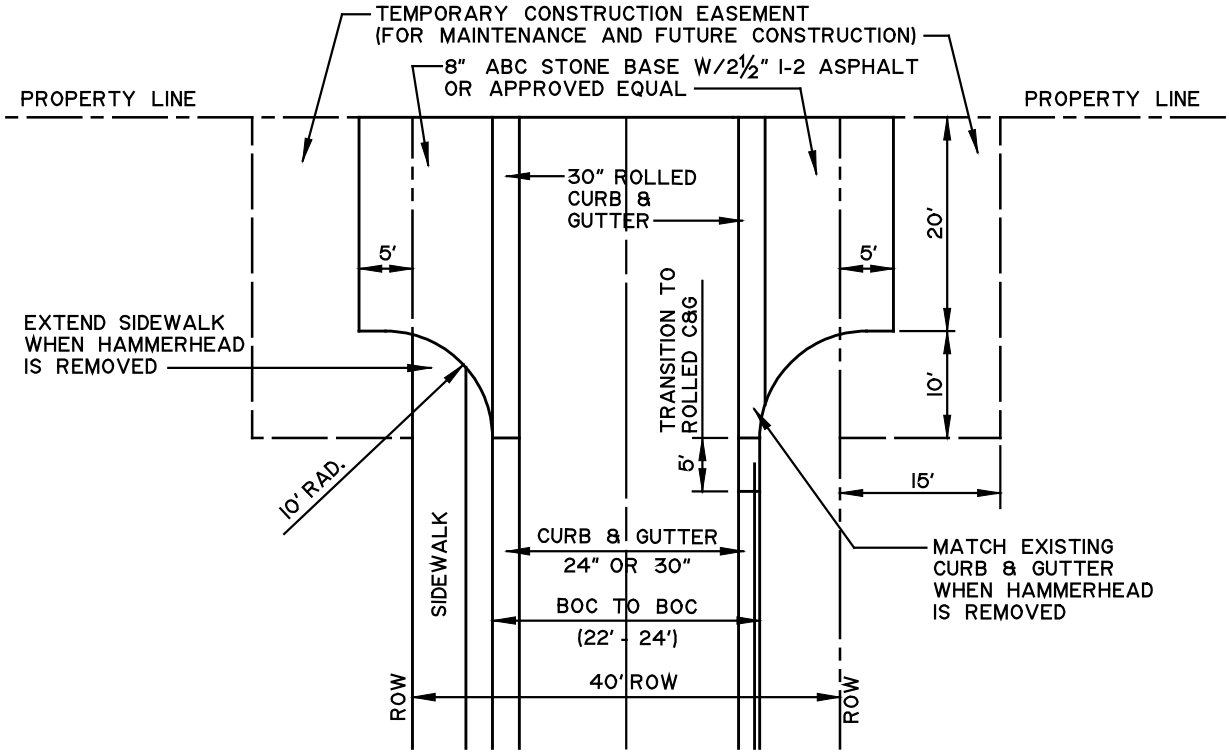
ROW WIDTH	BOC TO BOC
40'	23' to 25'

DURHAM
1869
CITY OF MEDICINE

DATE: AUG. 2003	**HAMMERHEAD CUL-DE-SAC WITH CURB & GUTTER**	**SCALE:** NONE
REVISED:	**CITY OF DURHAM, NORTH CAROLINA DEPARTMENT OF PUBLIC WORKS**	**DETAIL NO.** ST-14



50' RIGHT-OF-WAY



40' RIGHT-OF-WAY

DURHAM
1869
CITY OF MEDICINE

DATE: AUG. 2003	**TEMPORARY HAMMERHEAD TURN-AROUND**	SCALE: NONE
REVISED:	CITY OF DURHAM, NORTH CAROLINA DEPARTMENT OF PUBLIC WORKS	DETAIL NO. ST-15

Section 10.0

TRANSPORTATION

This section is intended to provide design criteria for street layout and vehicular movement. The Transportation Division is responsible for reviewing and approving the general design layout of traffic flow patterns, for reviewing and approving the plans and installations of street name signs, traffic control signs and devices, traffic impact studies and street lighting.

For street types and sections available for public and private streets, construction plan and profile guidelines refer to Section 9.0 Streets.

Below is a list of items and corresponding Department or Division that can assist the designer if unable to locate the information in the Zoning and Subdivision Ordinance.

Item	**Department/Division**
1. Site Access	1. Planning; Zoning/Subdivision Ordinance, Fire Protection
2. Parking Spaces	2. Planning; for size, number of spaces
3. Parking	3. Public Works/Transportation; for layout, orientation
4. Entrance Location/width	4. Public Works/Transportation, Fire Protection
5. NCDOT streets (existing/future)	5. NCDOT
6. Cul-de-sacs length	6. Public Works/Transportation
7. Number of units served	7. Public Works/Transportation
8. Design Speed	8. Public Works/Transportation
9. ROW required	9. Public Works/Transportation
10. ROW; existing width	10. County Court House (plat/deed books
11. Sidewalk required	11. Public Works/Transportation
12. Sidewalk location, design	12. Public Works/Engineering
13. Pavement Designs	13. Public Works/Engineering
14. Curb and Gutter design	14. Public Works/Engineering
15. Construction details	15. Public Works/Engineering
16. Street Construction Plans	16. Public Works/Engineering
17. Current Street Maintenance	17. Public Works/Engineering Services ; NCDOT
18. Bus routes	18. Public Works/Transportation

Section I. Layout

The purpose of these street standards is to create safe, livable, attractive streets. Streets are not used for a single purpose, but for multiple purposes. Properly designed streets provide access and mobility, corridors for pedestrian, bicycle, transit and motor vehicle movement, fire and emergency vehicle access, attractive public spaces, a place for neighborhood interaction, the efficient provision of public utilities networks including water supply, sanitary sewer, electricity, telecommunications and gas services, refuge disposal and for delivery of postal and other services. Properly designed streets create attractive communities and contribute to clearly defined sense of place. Streets shall be designed with due attention to building spacing and setbacks, and green spaces. A street should be designed according to its function. The street pattern shall provide acceptable levels of accessibility, safety and convenience for all street users in residential areas, while meeting community urban design requirements. The pattern should discourage residential streets from operating as through traffic routes for externally generated traffic, while limiting the length of time local drivers need to spend in a low-speed environment. The neighborhood street pattern should be simple, and logical, with the following characteristics exhibiting connectivity:

a. minimize excessive vehicular traffic and discourage inappropriate through traffic
b. conforming with the thoroughfare plan and/or other adopted corridor plans
c. fit with and complement pedestrian, bicycle and transit networks.

The design of the streets is intended to promote appropriate vehicular speeds on local neighborhood streets, and reasonable access requirements for emergency vehicles. Streets should be designed to reduce the potential for excessive speeds. Traffic calming elements may be necessary to accomplish this goal.

Section II. Signage and Pavement Marking Requirements

The developer is responsible for fabrication and installation of all required standard street name signs, traffic control signs, poles, and pavement markings within the public right-of-way. The developer shall submit a signing and markings plan to the City at construction plan stage for review and approval. All signs and pavement markings, shown on the construction plans, must be in place prior to the issuance of any certificate of occupancy. The developer will maintain the signs, poles, and markings until the street is accepted by the City of Durham, where from there, the City or NCDOT will maintain the signs, poles, and markings at no additional cost to the developer.

If decorative (non-standard) street lighting, signs or poles are desired, the City may permit the developer to install the decorative (non-standard) items if they meet the minimum requirements set out in the Manual on Uniform Traffic Control Devices, the City of Durham Street Lighting Policy, and the IES (Illuminating Engineering Society) Applicable Standards. **Designs and locations of decorative items must be approved by separate agreement with the City of Durham Transportation Division.**

Criteria

1. All signage installed shall conform to standards set forth by the latest published edition of the Manual on Uniform Traffic Control Devices (MUTCD), the North Carolina Department of Transportation (NCDOT) Standard Construction Drawings, and City of Durham standards.
2. Signage material shall conform to MUTCD color and reflectivity standards and shall at a minimum be engineering grade reflective material, except stop signs. Stop signs shall be constructed of hi-intensity grade material on a 30-inch by 30-inch octagonal stop sign blank.
3. All signs, except street markers, shall be mounted in a manner that the bottom of the sign is a minimum of seven feet (7-ft) above ground level. Street marker signs shall be mounted over the top of stop signs according to the street marker standards in number 7 below.
4. Ground mounted sign posts used to install street signage shall be 12 feet long and constructed of 14 gauge galvanized steel “U” channel posts or two inch (2-in) galvanized square steel tubing. When used in specific locations and directed by the City of Durham, colored ground mounted sign posts may be required to match existing streetscape in the project vicinity. Colored ground mounted supports shall be steel with a powder coated finish. All ground mounted sign posts shall have 3/8th inch holes down the center of the post drilled at one inch (1-in) spacing for the entire length of the post.

5. Ground mounted sign posts shall be driven to a minimum of 30 inches below ground level. All posts shall be plumbed and leveled as the post is installed.
6. If decorative (non-standard) items (poles, signs, etc.) are installed, it will be the responsibility of the developer to fabricate the items, install the items, and enter into an agreement with the City of Durham for the maintenance.
7. All street markers (street name signs) shall be designed and installed as follows:
   a. Street markers shall be installed at all street intersections and will include the block number of each street.
   b. All signage provided and installed shall be constructed from a 0.080 gauge anodized aluminum sign blank and conform to standard MUTCD sign sizes.
   c. Street markers shall be designed in a stacked configuration and located in a manner for visibility from all directions of travel.
   d. Street names shall be displayed by using a minimum of 4" reflective white letters and 2" reflective white numbers for the block numbers and abbreviations (RD, DR, etc.) on a reflective green background. On private streets, a notation of "private street" in 2" black letters on a yellow background will be added on the edge of the sign closest to the road. Signs must not have borders.
   e. The layout of the street markers shall conform to the City of Durham standard drawings. The street name shall appear centered vertically on the left of the street marker. The abbreviation shall appear to the top right of the street marker. The block number shall appear to the bottom right of the street marker. Each item should be spaced to balance the appearance of the street marker.
   f. Street marker material shall conform to MUTCD color and reflectivity standards and shall at a minimum be engineering grade reflective material.
   g. The letters shall be designed using the Standard Highway Alphabet of FHWA, series B.
   h. Two (2) sign blanks are required for each street name marker assembly. Each blank shall have a street name on both sides. The sign blanks shall be installed in a stacked manner using commercially available aluminum mounting hardware. Each assembly shall contain one (1) cross mount for flat blade street signs and one (1) U-channel or square post bracket for flat blade street name signs. Street markers for different streets shall be placed at right angles (see City of Durham standard drawings for street marker sign and street marker assembly construction). The street marker assembly shall be mounted to the U-channel or square post over the top of the stop signs. If a stop sign is not present, or the stop sign is not at an appropriate location for street markers, street markers shall be mounted on a separate u-channel or square post at the appropriate location.
   i. The length of the street marker is variable depending on the length of the street name, but should conform to table 1 below. The height of the street marker shall be 6 inches.

Table 1

Street Marker Blank Length

Street Name – number of letters*	Street marker blank length
3-7 letters	24-in
8-10 letters	30-in
11-13 letters	36-in
Above 13 letters	36-in plus 2-in per additional letter

* Number of letters refers to the name of the street, but not the abbreviations needed to label road, drive, avenue, street, etc..

8. Pavement markings shall be placed on the streets adjacent to the site where roadway improvements are required or will be placed on new streets to be accepted by the City of Durham. Pavement markings must be made of a thermoplastic material and adhere to section 1200 of the NCDOT Roadway Standard Drawings, 2002 edition.

Checklist for the signing and pavement marking plans:

_____ Note that signs and markings must be installed prior to certificate of occupancy and/or street acceptance, as determined by the City
_____ Stop signs/street markers
_____ No outlet signs
_____ Speed limit signs **(25 mph signs will be installed on streets that are more than 800 feet in length in subdivisions where needed)**
_____ Speed hump signs/markings
_____ Stop bars (24 inch white thermoplastic)
_____ Details of signs, spacing from ground, etc
_____ All signs conform to the Manual On Uniform Traffic Control Devices (MUTCD) unless otherwise noted
_____ Standard notes
_____ Crosswalk Pavement Markings
_____ Dimensions of Storage Bays, Bay Tapers, Transitions, Lane Widths, Crosswalks, etc.
_____ All Permanent Pavement Markings Shall Be Thermoplastic
_____ Details or Reference to NCDOT Standard Drawings
_____ Any Site Specific Notes
_____ Labeling of All Markings (Existing and Proposed)
_____ Other things: To be determined.

Standard notes

For site plan:

Add the following note to the special conditions of approval box: "The developer is responsible for fabrication and installation of all required signs and pavement markings within the public right-of-way. The developer shall submit a signing and markings plan to the City at construction plan stage for review and approval. All signs and pavement markings, shown on the construction plans, must be in place prior to the issuance of any certificate of occupancy and/or street acceptance, as determined by the City."

For construction drawings (signing and pavement marking plan):

1. All signs, street markers, and pavement markings (everything called out on the signing and marking sheet) must be installed on each street prior to the issuance of a certificate of occupancy and/or street acceptance, as determined by the City.
2. The street name sign shall be reflective to show the same shape and similar color both day and night. The letters and background shall be of contrasting colors.
3. Street name signs shall have white letters on a green background.
4. Lettering on the street names shall be 4" high in capital letters.
5. Suffix lettering to indicate the type of street (such as street, avenue, or road) or the section of the City (such as NW) shall be lettering 2" high.
6. Street name signs will be located on top of stop signs in a stacked position.
7. Stop bars shall be 2 feet wide white thermoplastic per NCDOT specifications.
8. All signs must conform with the Manual On Uniform Traffic Control Devices (MUTCD).
9. Street signs shall show block numbers. (Block numbers are shown on the recorded plat. If they are not shown on recorded plat, contact the City's Engineering Assessments Division at 560-4326)

Section III. Lighting Requirements

The City of Durham, at no additional cost to the developer or property owners, provides standard street lighting within the corporate city limits on city maintained streets. Street lighting is installed at all intersections and non-occupied cul-de-sacs. When requested by petition, extended street lighting may be installed in occupied cul-de-sacs and along the street blocks with an approximate spacing of 140'. The extended street lighting will be provided when budgeted funds are available.

The standard street light provided by the City of Durham is 9500 lumen, nema head, high pressure sodium unit mounted on a wooden pole at a minimum height of 20'.

A developer or legal home owner's association may elect to install decorative (non-standard) street lighting. This may be accomplished by ordering the non-standard lighting through the local utility company serving the area. At locations the City would have automatically installed the standard street lighting, the City may participate in the cost of the monthly electrical fees. Developers and associations considering this option are cautioned to consider possible problems with future maintenance.

Section IV. Guidelines for Traffic Impact Analysis (TIA)

Requirement:
A Traffic Impact Analysis (TIA) is required if the proposed development is expected to generate 150 or more peak hour vehicle trips as determined by the ITE Trip Generation Manual, most recent edition. The TIA must be of sufficient scope and detail to allow the City to evaluate the impact of the proposal and the need for roadway capacity, operation, and safety improvements resulting from the proposed development. Supplemental analysis may be required if there is a change in the development plan, site plan, or land use. A TIA is valid as long as the approved site plan or development plan associated with the TIA is deemed valid.

Preparer:
The report shall be prepared by a professional engineer who is registered in North Carolina and has expertise in traffic engineering.

Analysis Period:
The analysis must examine expected traffic conditions one year after the project is scheduled to be complete.

Pre-Submittal Conference:
Prior to submitting the TIA, the traffic engineer must consult with the City Transportation Division to discuss various assumptions for the study, including, but not limited to: trip generation assumptions, other approved developments within the study area, study area limits, trip distribution and pass-by traffic. This discussion may be accomplished via phone, e-mail or fax, or in person. TIAs submitted without a pre-submittal conference may be rejected.

Memorandum of Understanding:
The traffic engineer shall submit a memorandum of understand to the City Transportation Division to document the agreements made during the pre-submittal conference. The memorandum of understanding may be received by the City via e-mail, fax, or mail. The traffic engineer shall not begin work on the TIA until the City Transportation Division has approved the memorandum of understanding.

Trip Generation:
Trip generation estimates must be obtained from the latest version of the ITE Trip Generation Manual. The standard trip generation estimates to be used are those for the AM and PM peak hours of adjacent street traffic on a weekday. Exceptions to this may include churches, recreation facilities or other special generators. ITE procedures for generating traffic shall be used as specified in the Trip Generation Manual. Alternate rates may be used with prior approval by City Transportation staff. Any assumption regarding site traffic distribution or demand reduction via pass-by trips, internal trips, transit usage, or transportation demand management (TDM) strategies, must be approved in advance by the City Transportation staff and documented in the report. Include documentation calculations (i.e. rates or equations used for each land use) in the report.

Trip Distribution and Assignment:
Sketches of site traffic distribution percentages must be included. An accompanying trip assignment sketch should clearly indicate turning movements attributable to the project site at the analysis intersections.

Area of Analysis:
The analysis area should include all streets where site traffic will constitute 10% or more of any intersection approach during the peak hour. Current intersection turning movement counts must be obtained unless recent counts (within the last twelve months) are available from the City or NCDOT. All turning movement counts utilized must have been collected within the twelve months prior to the date of submittal and on weekdays (excluding Monday AM and Friday PM peak hours and holidays). Other peak periods such as noon or weekend periods, may be required if appropriate for the development. Efforts should be made to balance traffic volumes between closely spaced intersections where appropriate. City Transportation staff may require signal warrant analyses for high volume unsignalized intersections. The analysis must follow the warrant guidelines specified in the latest edition of the Federal Highway Manual of Uniform Traffic Control Devices (MUTCD).
The analysis may include recent crash data in the study area. The report should identify locations where traffic safety should be given extra consideration.

Approved Development Traffic:
As listed below, traffic from other nearby significant approved developments must be included in the analysis. Analysis of traffic from pending development projects with significant trip generation potential may also be required at the discretion of the City. Traffic volumes for any approved developments can be obtained from the City's Transportation Division.

Improvements:

Improvements which may be assumed in the analysis are those which have an expected completion date concurrent with that of the project and are either:

1. Funded in the City's Capital Improvement Program,
2. Funded through the State's Transportation Improvement Program, or
3. Indicated as required improvements of other approved development projects.

Those improvements related to other development projects must be clearly referenced in the report. Prior approval must be obtained from City Transportation staff to include other roadway improvements.

The study should clearly indicate those improvements offered by the developer to improve safety or operations. The goal is to achieve LOS D, ensure proper traffic operations, and mitigate potential safety concerns. Where existing conditions are below LOS D, improvements must be recommended that, at a minimum, attain LOS D unless otherwise approved by City staff.

Analysis Required:
The study shall be performed using the operational analysis of the latest Highway Capacity Manual and its associated software (Synchro HCM Reports may be substituted for HCS). Other software packages such as Synchro are preferred for coordinated signal systems and may be required for supplemental analysis. All signalized intersections within the analysis area, all project entrances, and all unsignalized intersections at which site traffic will constitute 10% or more of any one approach shall be modeled. Due to related impacts or current operational problems, the Transportation Division may require other adjacent intersections to be included in the study area. Safety, traffic simulation, gap, queue, traffic signal warrants, or other analyses may also be required under certain circumstances.

If a signal is part of a coordinated system, it must be analyzed as such under all scenarios. It is acceptable to optimize all signals for future alternative analyses, however present signal timings and phasing shall be used for the existing conditions analysis. The following assumptions shall be used unless City Transportation staff grants prior approval for variance. Supporting data may be required.

- A peak hour factor of .90 shall be applied for all cases except existing traffic.
- Zero right turns on red for signalized intersections as a worst-case scenario.
- Type III arrival rate.
- Minimum four (4) second yellow and two (2) second all-red clearance interval.
- Minimum seven (7) second green time per phase for left turns.
- Minimum ten (10) second green time for through movements.

- Preferred Signal Cycle Lengths:
    - Two or Three Phase = 60 second minimum, 120 second maximum
    - Four to Eight Phase = 110 second minimum, 180 second maximum

Intersections shall be analyzed under four scenarios:

1. Existing
2. No-Build (existing + 3% annual growth + approved developments)
3. Build (existing + 3% annual growth + approved + site traffic)
4. Build Improved (existing + 3% annual growth + approved + site + necessary improvements)

Scenario 4 may be eliminated if improvements are not necessary to satisfy any queuing problems or the LOS criteria listed herein. Overall LOS must be provided for all signalized intersections and worst movement LOS must be provided for all unsignalized intersections. Intersection analysis shall include queue analysis. The analysis year for all future scenarios is one year following the development's scheduled completion year (Build + 1).

Report Content:

Two copies of the final report should be submitted to the City Transportation Division, one copy shall be submitted to the City Planning Department, and if necessary, copies relating to projects impacting state roads should be submitted to the NCDOT District Office as well as the NCDOT Traffic Engineering Branch.

The report must include:

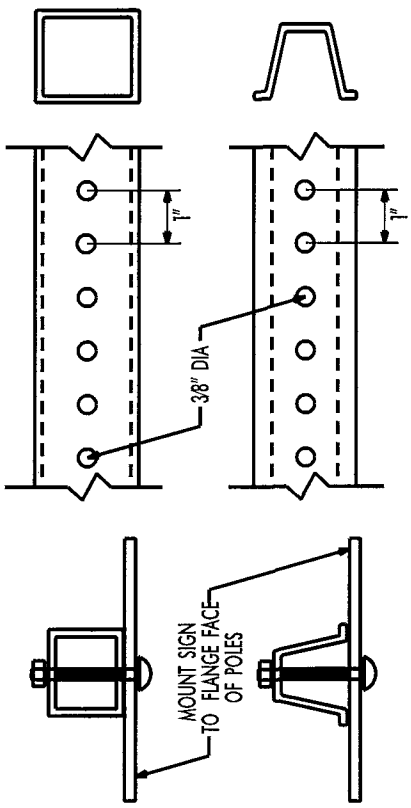
- A full size copy of the site/development plan, (If the site plan had a development plan preceding it, then the site plan must be consistent with the official development plan submitted to the City-County Planning Department.)
- A vicinity map,
- Speed limits of streets within the study area,
- Sketches of traffic distribution percentages and peak hour volumes,
- All capacity analyses (detailed report),
- Signal warrant studies, if appropriate,
- Intersection diagrams, which, as a minimum shall indicate:
    - The current approach and departure laneage at each intersection,
    - The distance between adjacent intersections,
    - The length of full width storage and departure for existing auxiliary lanes,
    - Recommended storage for proposed auxiliary lanes,
    - Any mid-block changes in cross section should also be noted, and
- Other documentation of data and assumptions used in the analysis.

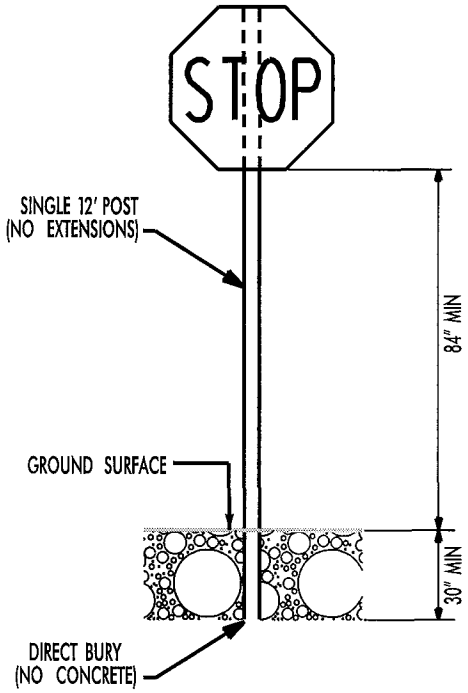
Any submittal not containing all of the above elements will be considered incomplete and shall not be reviewed until a complete submittal is received.

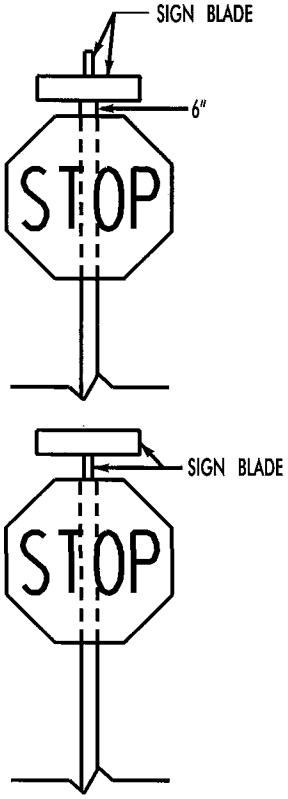
The report must clearly indicate those improvements proposed by the developer. For multi-phase developments, the phasing of improvements should be addressed. Capacity analyses may be required to confirm that the phasing of improvements will provide an acceptable level of service with each phase.

Attached are pages that illustrate the preferred outline (table of contents) for all TIA reports submitted to the City along with the Review Checklist used by City of Durham officials. ***See attachments.***

GENERAL SIGNAGE







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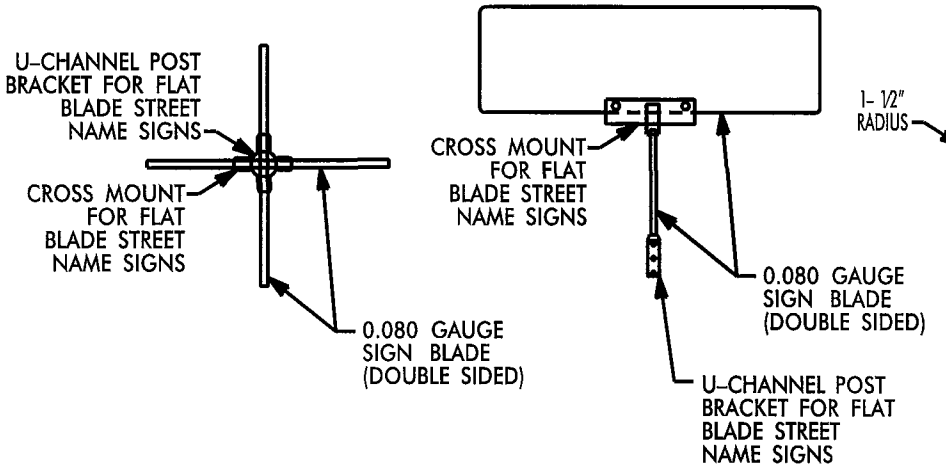

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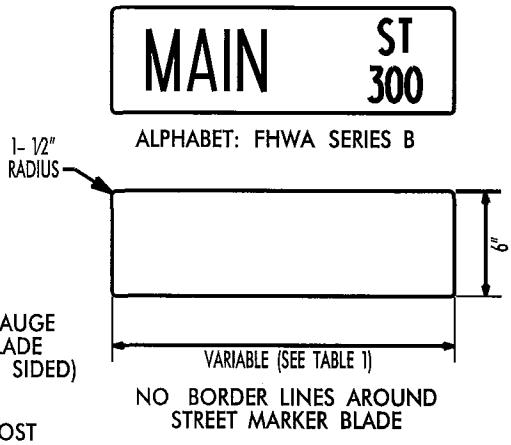

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12/28/2005

TIA Attachment #1 - Standard Table of Contents

FOR TIA REPORTS SUBMITTED TO THE CITY OF DURHAM

1. **Introduction**

2. **Executive Summary**

3. **Site Location and Access**
   - Figure: Vicinity Map
   - Figure: Site Plan Map
   - Figure: Existing Lane Geometry of Study Intersections *(include current approach and departure laneage at each intersection, distances between intersections, speed limits, and full width storage for exclusive turn lanes)*

4. **Existing Analysis**
   - Figure: Existing AM and PM Turning Movement Volumes
   - Table: Existing LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

5. **Future No-Build Analysis**
   - Figure: No-Build AM and PM Turning Movement Volumes
   - Table: No-Build LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

6. **Trip Generation**
   - Table: Trip Generation Rates *(Land use and quantity, ITE Code, and resulting ADT volumes, AM and PM Enter and Exit volumes included)*

7. **Trip Distribution and Assignment**
   - Figure: Directional Distribution Percentages
   - Figure: Site Generated Trip Assignment

8. **Future Build Analysis**
   - Figure: Build AM and PM Turning Movement Volumes
   - Table: Build LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

9. **Future Build Improved Analysis** ***(Not required if no improvements are necessary)***
   - Figure: Build Improved AM and PM Turning Movement Volumes
   - Table: Build Improved LOS Results *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*

10. **Supplemental Analysis (Safety, Signal Warrant, Queue, or other analysis as required)**

11. **Findings and Conclusions**
    - Table: LOS Comparison of All Scenarios *(Overall LOS indicated for signalized intersections and Worst Movement/Approach for unsignalized intersections)*
    - Figure: Roadway Lane Configurations *(Existing, Proposed, and Committed Improvements Indicated, with accompanying identification of parties responsible for improvments)*

Appendix – Count Data, Trip Generation, LOS Analysis and Output

TIA Attachment #2 -Traffic Impact Assessment
Review Checklist

Development Name : _____
Development Location : _____
Development Owner : _____
TIA Prepared by : _____ Company : _____
Site Plan Prepared by: _____ Company : _____
Review Date : _____ Reviewed By : _____

Submittal Package:

_____Full size copy of the site / development plan
_____Plans Sealed
_____TIA Sealed
_____Vicinity map
_____Speed limit(s) of streets within the study area
_____Sketch of traffic distribution percentages
_____Sketch of peak hour volumes
_____Capacity Analyses
_____Signal Warrant Study (if applicable)
_____Documentation of Data and Assumptions (traffic counts, trip generation, safety)
_____Intersection diagrams, including
    _____Approach laneage
    _____Departure laneage
    _____Distance between adjacent intersections
    _____Length of full-width storage in existing auxiliary lanes
    _____Recommended storage for proposed auxiliary lanes
_____Improvements proposed by developer clearly noted
_____Multi-phase development?
    _____Phased improvements addressed?
    _____Capacity analysis for phased improvement provided?

General Requirements:

_____Operational analysis performed using Highway Capacity Software / Synchro
_____All project entrances analyzed
_____All signalized intersections within study area analyzed
_____All unsignalized intersections where site traffic will constitute 10% or more of any one approach.
_____Other intersection analysis required??
    Which intersection(s): _____
    _____
    _____

Assumptions:

_____Peak hour factor of 0.9
_____Type Ill arrival rate
_____Minimum six (6) second yellow + all red clearance
_____Seven (7) second minimum green time per left turn movement
_____Ten (10) second minimum green time per left through movement (speed limit)

Scenarios Analyzed:

_____Existing traffic
_____No Build (Existing traffic + 3% annual growth + approved development traffic)
_____Build (Existing traffic + 3% annual growth + approved development traffic + site traffic)
_____Build Improved (Existing + 3% annual growth +approved development traffic+ site traffic+ necessary improvements)

Detailed Review Comments :

Existing Traffic Volumes: Are the existing counts based on recent peak hour turning movements? If older data were used, have they been updated using reasonable factors (agreed to by the City)? Are the seasonal and day of the week representative of the year or design year? Were construction or any other events that might have impacted the validity of the counts noted? _____

Comments: _____
_____

Trip Generation: Are the project trip generation rates from the latest edition of ITE's Trip Generation? If yes, are the rates based on a sufficient number of studies to be accurate and used correctly? If local trip generation rates are used, such as from similar developments in the area, is there adequate documentation to support the rates? _____

Comments: _____
_____

Reduction in Trip Generation: Are any trip reductions used for Pass-By Trips, Internal Capture Traffic, Transit, Ride-Sharing, etc. reasonable? Are reductions adequately documented? Is the source and rationale for reductions valid for this application? Are the full impact of turning movements addressed? _____

Comments: _____
_____

Trip Distribution / Assignment: Are the expected trip patterns to / from the subject site reasonable based on a market analysis, existing patterns, population distribution, or a network traffic assignment model, etc.? _____

Comments: _____
_____

Background Traffic: Is there a reasonable projection of non-project traffic on the nearby street system for the horizon year based on historic increases and consideration of approved projects in the vicinity? Are these volumes shown graphically? _____

Comments: _____
_____

Analysis: Are the correct time periods evaluated – i.e. AM peak hour, PM peak hour, daily / weekend peaks at shopping centers, recreational uses, etc.? Are levels of service shown for each movement at the study area intersections? Has the study addressed all issues from pre-study meetings / conferences / transmittals, etc.? _____

Comments: _____
_____

Access: Are the number of driveways proposed the minimum needed to accommodate site traffic? Could conditions be improved with some sort of shared access system or relocation of access points? _____

Comments: _____
_____
_____

Mitigation Alternatives: If the study acknowledges that improvements to the roadway system will be needed, are the proposed mitigation alternatives reasonable and implementable? _____

Comments: _____
_____
_____

Mitigation Timing: Are the timing and responsibility for implementing mitigation measures addressed sufficiently? Are there any recommended roadway improvements which are not addressed? _____

Comments: _____
_____

Review Meeting: Is there a need for a joint meeting between the City, community representatives, adjacent communities, others, and the developer to discuss traffic issues related to this project prior to any approval? _____

Comments: _____
_____

SECTION 11.0

SIDEWALKS

This section is intended to provide design criteria for sidewalk layout and construction.

I. General

1. Sidewalk plans shall be to conditions as shown on site plan or field adjusted.
2. Add the following note for the proposed sidewalk located within the ROW;

   The location of the sidewalk shown on this plan is schematic. A City of Durham and /or NCDOT encroachment permit is required prior to any construction. After obtaining the required permits, please contact the City of Durham Engineering Construction Inspection office at 560-4326 for a pre-construction conference and field visit prior to any work on the proposed sidewalk.

3. Sidewalks are to be constructed inside and adjacent to the right-of way.
4. Sidewalks shall extend to all intersections (even crossing roadside ditches).
5. All sidewalks at intersections to have handicap ramps according to the City of Durham details and specifications. At NCDOT roads, two ramps at each corner.
6. Sidewalks shall be a minimum of 4 inches thick and 6 inches thick across driveways.
7. Sidewalks shall be a minimum of 5 feet wide.
8. If a meter is installed in the sidewalk, then the meter shall be installed at the back of sidewalk or can be installed in the sidewalk providing the water meter box top is flush, smooth and is not a tripping hazard.
9. Public sidewalks will have no wire reinforcing.
10. Sidewalks to extend across all driveways (6 inches thick).
11. All handicapped ramps shall be 6 inches thick.
12. The sidewalk and handicap ramp from PC to PT through a radius shall be 6 inches thick.
13. Sidewalks shall be 3,000 psi concrete.
14. Payment in lieu for sidewalk construction may be an option for sites if it can be demonstrated to the approving body that such construction may cause undo construction hardship (culverts, bridges, etc.). The hardship must be demonstrated before a plan is submitted with the payment in lieu note on the plan. A request should be submitted in writing prior to the City/County Planning Department's Development Review Board's (DRB) consideration. DRB must grant approval of this option during review of the site plan.
15. On major and minor thoroughfares within the UGA, sidewalks must be placed on both sides of the road. All other roads within the UGA, sidewalk must be placed on at least one side of the road. The Transportation Division, at its own discretion, may require that sidewalks be constructed on both sides of roads in heavy commercial, heavy retail or heavy residential areas. On all site plans, sidewalk must be designated as so whether it is existing sidewalk or proposed sidewalk.
16. Sidewalks shall be placed as directed by the Engineering Division at an elevation that corresponds with future widening such that the sidewalk will not need to be replaced when future widening takes place.

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SECTION 12.0

STANDARD NOTES

This section contains the most commonly used notes and easement phrases. Some of the dimensions are left blank since it is a variable number. Refer to the Durham City/County Zoning Ordinance for the requirements of these dimensions.

Engineering Standard Site Plan Notes. In the special conditions of approval box, always add the following notes:

All sizes, materials, slopes, geometry, locations, evaluations, extensions and depths for all existing and proposed streets and utilities (waterlines, sanitary sewer lines and storm drainage conveyance systems) shall be designed to the specifications set forth in the design criteria and standards of the Public Works Department and be subject to review and approval by the Public Works Department at construction drawing submittal.

The designing professional (a NCPE, NCPLS or NCRLA – as required) will submit 3 sets of construction drawings to City Engineering for review and approval before starting construction (see Construction Plan Approval Process). NOTE: The approval of construction drawings is separate from site plan approval.

In the special conditions of approval box, add the following notes as required:
Extension Agreement required (submit after site plan approved but before construction plans). Contact Engineering Division (560-4326, FAX 560-4316) with complete name (Individual, Inc., Corp., etc) and telephone number of entity extending services to the site.

Annexation petition required. Contact Budget Department @ 560-4111

If a hydrant is proposed a fire flow analysis is required. Waterline size may change with fire flow analysis. Contact City Engineering @ 560-4326 to schedule flow test or to obtain current system data.

Water and sewer permits are required for this project.

An executed stormwater facility operation and maintenance permit agreement (prepared by Stormwater Services, City of Durham), payment of a stormwater facility permit fee ($2,000 per detention / water quality device) and perpetual surety for the continued operation and maintenance of the facility is required prior to construction plan approval.

Back flow permit required with this project.

A City of Durham Driveway permit is required.

A NCDOT or City of Durham Driveway Permit is required.

Water easement note:

Centerline of _____ foot wide City of Durham Water Easement. Subject to terms stated in the Declaration in Real Estate Book 1510, page 958. No structures, fill, embankments, trees or obstructions permitted within the easement except according to those terms.

Sanitary sewer easement note:

Centerline of _____ foot wide City of Durham Sanitary Sewer Easement. Subject to terms stated in the Declaration in Real Estate Book 1510, page 958. No structures, fill, embankments, trees or obstructions permitted within the easement except according to those terms.

Centerline of _____ foot wide County of Durham Sanitary Sewer Easement. Subject to terms stated in the Declaration in Real Estate Book 1626, page 145. No structures, fill, embankments, trees or obstructions permitted within the easement except according to those terms.

Sidewalk note:

The location of the sidewalks shown on this plan is schematic. A City of Durham and/or NCDOT encroachment permit is required prior to any construction. After obtaining the required permits, please contact the City of Durham Engineering Construction Inspection office at 560-4326 for a pre-construction conference and field visit prior to any work on the proposed sidewalk.

Driveway permit notes:

A City of Durham Driveway Permit is required prior to any driveway construction on public right-of-way. Submit plans for Driveway Permit approval to City Engineering Development Review. After obtaining the permit, please call City of Durham Engineering Inspection office at 560-4326 prior to start of construction.

NCDOT Driveway Permit required prior to construction. Contact NCDOT at 560-6854 for requirements.

Utility Notes:

A Utility Mainline Construction permit is required prior to the installation of each utility. All utilities shall submit plan drawings and applications to the City Engineering Division.

Water service abandonment:

Abandonment of water services shall include excavating down to corporation, turning it off and cutting service line free from corporation. The meter, if present, shall be returned to City of Durham.

Sanitary sewer service abandonment:

Abandonment of sanitary sewer service lines shall consist of excavating down to the service connection to the main, cutting this connection and installing a watertight plug in the main. All clean-out risers on the service line should be removed. The service line can be abandoned in place.

Provide Utility Crossing Construction note where there are new mainline (public or private) utilities proposed on plans as follows:

Water, sanitary sewer and storm sewer separation notes:

1. *Horizontal and Vertical Separation*

   A. *Sanitary Sewers shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10-foot separation, the City of Durham may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation on may allow the installation of the sanitary sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sanitary sewer and at an elevation so the bottom of the water main is at least 18 inches above the top of the sewer.*

   B. *If it is impossible to obtain proper horizontal and vertical separation as described above or anytime the sanitary sewer is over the water main, both the water main and sanitary sewer must be constructed of ferrous pipe complying with the public water supply design standards and be pressure tested to 150 psi to assure water tightness before backfilling.*

   C. *A 12-inch vertical separation shall be provided between storm sewer and sanitary sewer lines or ferrous pipe specified. A 12-inch vertical separation shall be provided between storm sewer and water mains.*
      1. *If a 12 inch vertical separation is not maintained at a crossing between storm sewer and water mains (or pressure sewers). The water main shall be constructed of ferrous pipe and a concrete collar shall be poured around water mains and storm sewer to immobilize the crossing.*

2. *Crossings*

   A. *Sanitary Sewer crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sanitary sewer. The crossing shall be arranged so that the sanitary sewer joints will be equidistant and as far as possible from the water main joints.*

   B. *When it is impossible to obtain proper horizontal and vertical separation as stipulated above, one of the following methods must be specified.*
      1. *The sanitary sewer shall be designed and constructed of ferrous pipe and shall be pressure tested at 150 psi to assure water tightness prior to backfilling, or*
      2. *Either the water main or the sanitary sewer line may be encased in a watertight carrier pipe, which extends 10 feet on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of materials approved by the City of Durham for use in water main construction.*

Townhome Note:

Townhome developments may be designed and constructed with parking areas on both sides of the travel lanes. This configuration is not to be considered a street. If this option is used, the travel and parking areas shall be noted as "Private Access and Common Areas". As such, the Developer shall acknowledge and make prospective buyers aware that these areas will not be assigned a street name, nor will they ever be eligible for maintenance by the City of Durham. The Developer will ensure that all of the access and common area property is described in the covenants and that the Home Owners Association is responsible for the maintenance of this area. The following note shall be added to all site plans and plats associated with the development:

The driving and parking areas shown on this drawing noted as "Private Access and Common Areas" do not meet City of Durham street standards. The features within this area are private and will never be eligible for public maintenance.

Storm drainage easement note:

Centerline of _____ foot wide public storm water drainage easement. Ownership of, and responsibility for improvement and maintenance of storm water facilities in this easement remains with the current owner. If the property is within or becomes a part of the City, the easement and access points to the easement are subject to the terms and restrictions stated in the "Revised Declaration of Rights and Privileges of the City of Durham in Storm Water Management Facility Easements" recorded in Real Estate Book 2298, Page 208, which document is incorporated herein. This easement and the Revised Declaration do not create the obligation to provide public maintenance. No building, structures, fills, embankments or obstructions permitted within the easement except according to those terms.

To install storm drainage facilities that are not part of a site plan:

Permit required prior to construction of storm drainage facilities. Permit to be obtained from City of Durham Engineering with a copy of the approved plans. Apply for permit within 30 days of starting work. Prior to any construction, contact Engineering Construction Inspection office at 560-4326 a minimum of 48 hours ahead of time to coordinate inspection prior to actual construction.

Stream buffer notes:

_____ foot wide undisturbed stream buffer each side of stream, measured from top of bank. No clearing or grading other than selective thinning and ordinary maintenance of existing vegetation permitted.

Flood plain notes:

All development within the floodway and floodway fringe, including fill, new construction, substantial improvements, manufactured housing, storage of materials and storage of toxic or flammable substances, is prohibited except as provided by applicable Flood Hazard Regulations.

State and federal permit authorization may be required from the DEHNR and the U.S. Corps of Engineers prior to the commencement of any land disturbing activities in or near a lake, stream, creek, tributary or any unnamed body of water and its adjacent wetlands.

FEMA Flood Study Required, add the following notes to the special conditions of approval box:

A CLOMR shall be obtained from FEMA before site plan approval.
A LOMR shall be obtained from FEMA before applying for building permits.

For Developments in the Neuse River Basin, add the following note to the special conditions of approval box:

A site plan cannot be approved until a receipt from the Wetlands Restoration Fund (WRF) has been received (by the City of Durham Stormwater Services Division) confirming the payment of $X.XX (to be determined by Stormwater Services) in offset fees.

For Developments that require a Stormwater Best Management Practice, add the following notes to the special conditions of approval box:

An executed stormwater facility operation and maintenance permit agreement (prepared by Stormwater Services, City of Durham), payment of a stormwater facility permit fee ($2,000 per detention / water quality device) and perpetual surety for the continued operation and maintenance of the facility is required prior to construction plan approval.

An as-built certification, provided by the design engineer, is required prior to issuance of a certificate of occupancy.

A completed City of Durham Design Summary is required (for each detention/water quality device) no later than at the first construction drawing submittal.

Stormwater BMP designs and calculations will not be reviewed approved with the site plan. All designs to be reviewed and approved at the construction drawing stage.

Where Streets terminate, add the following note to the construction drawings:

Where streets terminate (example Phase lines) the following will be installed: 1) Asphalt header, 2) Riprap or concrete apron for storm water to dissipate, 3) Utilities to extend a minimum of 5' beyond the edge of pavement, 4) NCDOT type III barricade.

Off-site roadway improvements, add the following note to the special conditions of approval box:

By referencing roadway improvements on the plan, the applicant agrees to construct said improvements prior to issuance of certificate of occupancy in a manner that will allow them to function as noted on the plan and in accordance with NCDOT and City of Durham standards and policies. This includes (where appropriate) but is not limited to: adequate transition tapers, alignment of lanes through intersections, associated signal modifications, pavement markings, associated signage, curb and gutter, coordination with other proposed roadway improvements and bike lanes. The applicant also accepts the financial responsibility for acquisition of any additional right-of-way necessary to accommodate these improvements and any required sidewalk construction.

Signs and/or pavement markings to be installed by the developer (new subdivisions or off-site roadway improvements that need new markings for example), add the following note to the special conditions of approval box:

The developer is responsible for fabrication and installation of all required signs and pavement markings within the public right-of-way. The developer shall submit a signing and markings plan to the City at construction plan stage for review and approval. All signs and pavement markings, shown on the construction plans, must be in place prior to the issuance of any certificate of occupancy and/or street acceptance, as determined by the City.

Right-of-way dedication on a major/minor thoroughfare adjacent to the site, add the following note to the special conditions of approval box:

Dedicate an additional ___ feet of right-of-way along the frontage of the site on _____ Road prior to the issuance of any building permit. ***A copy of the recorded plat must be submitted with the first building permit application****.*

Bus stop/shelter is to be constructed near the site, add the following note to the special conditions of approval box:

Provide bus shelter with concrete pad on _____ Road. Design specifications and exact location to be reviewed and approved by DATA prior to construction.

Off-site roadway improvements on the site, add the following note to the special conditions of approval box:

All off-site roadway improvements must be complete prior to the issuance of any certificate of occupancy.

Variations to these standard notes may be applied with the express consent of the Transportation Division.

<u>Signage and Marking Plan Construction Drawing Notes:</u>

1. All signs, street markers, and pavement markings (everything called out on the signing and marking sheet) must be installed on each street prior to the issuance of a certificate of occupancy and/or street acceptance, as determined by the City.
2. The street name sign shall be reflective to show the same shape and similar color both day and night. The letters and background shall be of contrasting colors.
3. Street name signs shall have white letters on a green background.
4. Lettering on the street names shall be 4” high in capital letters.
5. Suffix lettering to indicate the type of street (such as street, avenue, or road) or the section of the City (such as NW) shall be lettering 2” high.

6. Street name signs will be located on top of stop signs in a stacked position.
7. Stop bars shall be 2 feet wide white thermoplastic per NCDOT specifications.
8. All signs must conform with the Manual On Uniform Traffic Control Devices (MUTCD).
9. Street signs shall show block numbers. (Block numbers are shown on the recorded plat. If they are not shown on recorded plat, contact the City's Engineering Assessments Division at 560-4326)

SECTION 13.0

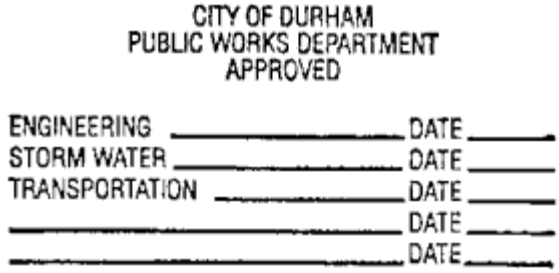
FORMS

This section is intended to provide standard forms, checklists and permit applications that the City of Durham Engineering Division uses when reviewing and approving plats, site plans, construction drawings and permits. These can be reproduced and used as originals. Note that some forms are two-sided.

These forms may be updated periodically. Contact City of Durham Engineering to verify the latest edition is being

Construction Plan Approval Stamp

The stamp below is used on all approved construction drawings (refer to Section 2.1 Construction Plan Approval Process). This is a copy of the City of Durham Engineering approval stamp that is to be placed on the right side of all sheets that are to be sealed and signed off by Engineering. The applicant can reproduce this stamp and place it on the drawings so that the originals can be signed or the stamp will be applied to the originals when submitted for construction plan approval.



PDF format - Acrobat Reader required

Forms:

Extension Agreement Application July 2004

License Agreement Application July 2004

Low Water Pressure Acknowledgement Form October03

Gravity Sewer permit Application October 2003

Water Permit Application October 2003

Fire Flow Test Request Application Form July 2004

Project Information Form October 2003

City of Durham Utility Right of Way Permit Request Form October 2003

Engineering Moving Information Form October 2003

Engineering Demolition Information Form October 2003

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CITY OF MEDICINE

City of Durham
Public Works Department
Engineering Division

101 City Hall Plaza, 3rd Floor, Durham, NC 27701
Telephone: (919) 560-4326 Facsimile: (919) 560-4316

EXTENSION AGREEMENT APPLICATION

Failure to complete this form correctly(print or type)will cause a delay

Submit this form, one copy of utility plans and fee of $200.00, in check form, made payable to the City of Durham

Date Submitted _____
Street Address of parcel (if applicable): _____
Property Identification Number (PIN) _____
Tax map Number(if applicable): _____
Project Acreage (size of the project that needs utilities extended to it): _____ Acres
Project Name (i.e., subdivision name): _____
Project Location (brief narration describing the location of the project including distances to cross streets):

_____

_____

Extension of (Check what applies): ☐ Water ☐ Sewer
Description of proposed improvements: _____

_____

_____

_____

APPLICANT INFORMATION

Full Address of Applicant (person or company applying for the owner):

_____

_____

_____

Telephone Number: _____ Facsimile Number: _____

OWNER INFORMATION

Legal name of owner (party responsible for improvements) entering into agreement (be specific):

_____

i.e. John Doe, Individual: Doe Utilities, Inc. (a N.C. Corporation)
NOTE: Corporation names should appear as shown on corporate seal!, Doe & Company, L.L.C., etc.
Validity of corporation or limited liability company will be verified with Secretary of State

Full address of Owner: _____

_____

_____

Telephone Number: _____ Facsimile Number: _____
President: _____
Vice-President: _____
Secretary: _____
Treasurer: _____
Managing Partner: _____

***********For City of Durham Use*********

Annexation Required? ☐ *Yes* ☐ *No* *If Yes:* ☐ *Contiguous* ☐ *Non-Contiguous*
Additional Comments:

_____

_____

_____

(updated July, 2004)

(Over for Agreement Process)

EXTENSION AGREEMENT for Water and Sewer
Approval procedure with the City of Durham

Who needs to apply for an extension agreement?
If you propose to extend the City water or sewer system, you must first enter into a Utility Extension Agreement with the City of Durham

How do I know if I need an Utility Extension Agreement?
If you are not sure if an agreement is needed submit to City Engineering a map outlining the tract of land (reference PIN and tax map numbers and locate existing and proposed water and sewer lines on the map). City engineering will review this information (normally within 1 week unless there is unusual circumstances) and contact you if an agreement is needed and if plans need to be submitted. Extension Agreements can be required if a water or sanitary sewer permit would be required. *Please do not forget to indicate how we are to get back in touch with you.*

What is submitted?
Complete the Utility Extension Agreement (other side of this sheet) and submit it back to City Engineering as soon as possible. *Include a overall proposed utility plan for the project to aid in the description process*. This information will be used to compose the extension agreement. *Let us know who the agreement is to be sent to for execution*. Upon executing the agreement *all three* originals should be sent back to Engineering to be validated and forwarded onto City Council for ultimate approval. ***Council approval is required before construction plans can be approved for projects outside the City limits***. Since this cycle can take over a month we recommend that the Extension Agreement Application be submitted as soon as possible.

Who can submit construction drawings?
A Professional Engineer with the State of North Carolina will submit to City Engineering plan and profile construction drawings (plan view on top on 24" x 36" sheets with scale of 1"=40' horizontal and 1"=4 vertical). Three sets of construction drawings should be submitted to City Engineering for review. Upon completion of review (usually two weeks unless there is something unusual about the project) the plans will be returned for corrections. Some corrections require an additional submittal and review. After the plans have been corrected the City will request that the original construction drawings be submitted for stamping and signoff. When the plans have been signed they will be returned along with a transmittal letter and the appropriate permit applications. *Construction of these lines cannot be started without approved permits.*

How long does it take to get a water or sewer permit?
In an effort to help expedite the review process the City of Durham is a delegated municipality for issuing water and sewer permits and can usually complete the permit review process within two weeks. Upon receipt of complete permit applications, plans and permit fees, these documents are reviewed to verify that all State requirements have been met. Some sewer permits are still reviewed by the State of North Carolina (pump stations and sites tributary to Durham County Water Reclamation Facility). The permits that go to the State will be identified in the review process. *Construction of these lines cannot be started without approved permits.*

Do not hesitate to contact us if you have any questions. Our location is referenced at the top of the application on the back side of this sheet.

(updated July 2004)

(Over for Agreement application)

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City of Durham
Public Works Department
Engineering Division

101 City Hall Plaza, 3rd Floor, Durham, NC 27701
Telephone: (919) 560-4326 Facsimile: (919) 560-4316

LICENSE AGREEMENT APPLICATION

Failure to complete this form correctly (print or type) will cause a delay in the approval process.
Submit the Form, 1 set of construction drawings, and a fee of $200.00, in check form, made payable to the City of Durham

Date Submitted _____

PARCEL INFORMATION:

1. _____
Street Address of Parcel (if applicable):

_____ _____
PIN *Tax Map Number (if applicable)*

3. _____
Project Name (i.e. subdivision name)

4. Description of proposed improvements inside right-of-way: _____

_____

_____

APPLICANT INFORMATION:

5. _____ 6. _____
(Print or Type Name of Applicant or Representative) *(Title)*

7. _____
(Applicant's Address) *(City, State,Zip)*

8. ( ) _____ 9. ( ) _____
(Applicant's Telephone Number) *(Applicant's FAX Number)*

OWNER INFORMATION:

10. Legal name of party (owner of improvement inside ROW) entering into agreement (be specific):

_____

_____
Examples: John Doe, Individual: Doe Utilities, Inc. (an N.C. Corporation) Note: Corporation names should appear as shown on corporate seal! Doe & Company, L.L.C., etc. Validity of corporation or limited liability company wil be verified with Secretary of State.

11. _____ 12. _____
(Party's Contact or Representative Name) *(Title)*

13. _____
(Party's Address)

14. ( ) _____ 15. ( ) _____
(Party's Telephone Number) *(Party's FAX Number)*

16. _____ 17. _____
(Signature) *(Date)*

18. **Officers of agreement party, if applicable: Fill in only appropriate spaces:**

President:			
Vice-President:			
Secretary:			
Treasurer:			
Managing Partner:			
(List Other Title if applicable)	*(Print Name)*	*(Signature)*	

(Revised July 2004)

(Over for Agreement Process)

LICENSE AGREEMENT

Approval procedure with the City of Durham

Who needs to apply for a License Agreement?
If you propose to cross or encroach on any City of Durham street right-of-way (ROW) with a private sign, street feature (i.e. special pavers, decorative pavement markings) or a private utility (irrigation line, electrical line, etc.…) a License Agreement with the City of Durham is required. This includes new developments currently under review or construction.

How do I know if I need a License Agreement?
If you are not sure if an agreement is needed submit to City Engineering a map outlining the tract of land (reference tax map numbers; project name) and locate existing streets and ROW that is to be crossed. The City Engineering Department will review this information (normally within 1 week unless there is unusual circumstances) and contact you if an agreement is needed and if plans need to be submitted. *Please do not forget to indicate how we are to get back in touch with you.*

What is submitted?
1. Complete the License Agreement application (located on the other side of this sheet) and submit it back to City Engineering. The information on the application will be used to prepare a License Agreement. The License Agreement will be sent back to you for signatures and notarizations. *Do not forget to let us know where to send back the Agreement for signatures*. Return the signed Agreement back to City Engineering where it will be forwarded onto City Council for ultimate approval. *Council approval is required before construction can begin*. Since this cycle can take over a month we recommend that the License Agreement application be submitted as soon as possible.
2. A check in the amount of $200.00 made payable to the City of Durham to be submitted when the License Agreement is signed and being returned to City Engineering.
3. Construction drawings (see below for construction plan requirements).

What are Construction Drawings?
Construction drawings are plans that identify the encroachment in the ROW on **8 ½"x11**" sheets of paper. Three sets of construction drawings should submitted to City Engineering for review. Upon completion of review (usually within two weeks unless there is something unusual about the project then it could take longer) the plans will be returned for corrections. Some corrections require an additional submittal and review. These drawings will become part of the License Agreement. There is to be a plan view and a cross section of the proposed encroachment.

PLAN VIEW (minimum layout information)

Title Block with applicant and owner information; Vicinity Map or show nearest cross street; North Arrow; Scale; Location of all existing utilities (sizes and material) with locations dimensioned; Street names; Location of edge of street with dimensions; Type of street (curb and gutter, gravel, etc…); Proposed improvement (perpendicular crossing of ROW) dimensioned to street; Carrier pipe to extend beyond ROW; Irrigation lines to be copper within ROW; Irrigation lines to have a manual control valve located just outside of the ROW on the supply side of the line; Irrigation lines to show spray heads located outside of ROW with spray patterns (no spray patterns onto roadway); For irrigation of traffic islands show trench drains and slotted PVC pipe installed behind all curb in the island and discharging into a storm inlet or to daylight; No proposed pedestals or manholes inside ROW.

CROSS SECTION VIEW (minimum layout information)

Existing top of grade (curb lines, pavement…etc.) across ROW; Existing water, sewer or other underground utility that must be crossed with dimensions of depth and dimensions relative to each other; Carrier pipe to extend beyond ROW; Show proposed pedestals or manholes if needed outside of ROW.

Do not hesitate to contact us if you have any questions. Our location is referenced at the top of the application on the back side of this sheet.

(Revised July 2004)

(Over for Agreement application)

DURHAM
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City of Durham
Public Works Department
Engineering Division

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Telephone: (919) 560-4326 Facsimile: (919) 560-4316

LOW WATER PRESSURE ACKNOWLEDGEMENT

This document applies only to those properties that the City has designated as being in an area of potentially low water pressure. This document is not available for use in areas other than those so designated.

PROJECT DATA:

PIN or Tax Map Number: _____

Project Name: _____

Project Address: (if known) _____

To better serve the community, we are alerting builders/owners/designers that in certain sections of Durham there is a potential for having low water pressure and that a booster pump may be needed to improve service to the site. The site referenced above is in the area designated as potentially having low pressure. City of Durham requires that the applicant be made aware of this potential and that the applicant acknowledges that either a booster pump will be installed or they will be required to explain why one is not needed.

Be advised that a booster pump will require a back flow device and a separate permit from Cross Connection (560-4194). If a booster pump is installed it is the applicants responsibility to contact Cross Connection and apply for a permit.

> ***By my signature below I acknowledge that a booster pump may be needed to provide adequate domestic service and/or fire flow to the site referenced above. I further acknowledge that if I choose NOT to install a booster pump that I and my successors will not hold the City of Durham liable for any complications or damage that may result from low water pressure.***

Will Booster Pump be installed?

YES ☐

NO ☐

If NO, explain: _____

_____

Signed: _____

Print: _____

Title (owner/designer/builder…): _____

Date: _____

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Public Works Department
Engineering Division

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GRAVITY SEWER EXTENSION PERMIT APPLICATION

Submit this original, 2 sets of approved plans and fee of $450.00, in check form, made payable to the City of Durham. Note: If the proposed system contains public and private sewer mains, separate permit forms, fees, and approved plans must be provided (i.e. one application, $450.00 check, 2 sets of approved plans for public and one application, $450.00 check, and 2 sets of approved plans for private).

I. GENERAL INFORMATION:

Date Submitted: _____
Permit Number: _____ *(Assigned by the City)*

1. _____ *(Project Name)*
2. _____ *(Project PIN or Tax Map Number)*
3. _____ *(Project Address)*
4. Public _____ Private _____
5. _____ *(Developer's Company Name)*
6. _____ *(Developer's Address)* *(City, State, Zip)*
7. ( ) _____ *(Developer's Telephone Number)*
8. ( ) _____ *(Developer's FAX Number)*
9. _____ *(Print or Type Name of Developer's Representative)*
10. _____ *(Title)*
11. _____ *(Signature)*
12. _____ *(Date)*
13. _____ *(Engineer's Name)*
14. _____ *(Engineer's Company Name)*
15. _____ *(Engineer's Company Address)*
16. ( ) _____ *(Engineer's Telephone Number)*
17. ( ) _____ *(Engineer's FAX Number)*

II. PERMIT INFORMATION:

1. Project is ☐ New; ☐ Renewal; ☐ Modification.

   If Renewal or Modification, existing Permit No.: _____ Issue Date: _____
   (Contact Water & Sewer Engineering at (919) 560-4326 for proper procedure.)

2 Project is: ☐ Public; ☐ Private.
   If private, applicant will be: ☐ Retaining Ownership ☐ Selling Units (provide DWQ DEV 02/03 Form *)

3. Water Reclamation Facility: ☐ North Durham, Facility No. NC 0023841
   ☐ South Durham, Facility No. NC 0047597

4. Volume of wastewater generated by this project: _____ Gallons per day.

_____ % Domestic _____ % Commercial _____ % Industrial
_____ % Other (specify): _____

5. Explanation of how wastewater volume and makeup was determined: _____

_____

_____

6. If wastewater is other than domestic in nature, has a pretreatment application been approved by the City of Durham Department of Water Resources? Yes ☐ No ☐

III. DESIGN INFORMATION:

1. Brief project description: _____

_____

_____

2. Summary of sewer pipe by diameter and pipe material. Indicate here whether C factor of N factor is used and circle C or N below: Note length in this table is the total length of sanitary sewer lines of a specific size and material. (ie, 2000' of 8" PVC main, 400' of 8" DIP)

Diameter (in.)	Length (ft.)	Pipe Material	C or N Factor	Minimum Slope %	Maximum Slope %	Max. Vel. (fps)

Note: The minimum velocity must not be less than 2.5 fps, the minimum diameter for public sewer mains is 8-inches, the minimum slope for 8-inch diameter mains is 0.5%.

3. Anchors shall be provided for sewers with slopes greater than 20%. The anchor spacing shall be as follows:

a. 36 foot separation for slopes of 21% to 35%.
b. 24 foot separation for slopes of 36% to 50%.
c. 16 foot separation for slopes of 51% or greater.

For velocities greater than 15 fps, erosion control measures must be specified to protect the sewer lines and manholes.

If required, have anchors and/or erosion control measures been specified and detailed on these plans? Yes ☐ No ☐

4. Is sewer subject to existing or planned traffic bearing loads? Yes ☐ No ☐
   If yes, have measures been taken to enable sewer to withstand the loads? Yes ☐ No ☐

5. Maximum sewer reach length between manholes is _____ lineal feet (400' max.)
   Does the owner/operator have the ability to clean this length? Yes ☐ No ☐

6. Does minimum cover for sewer mains and/or outfalls satisfy the following requirements?
   a. 4 ft. minimum cover over all sewer outfalls? Yes ☐ No ☐
   b. 5 ft. minimum cover over all sewer mains? Yes ☐ No ☐
   c. 3 ft. minimum from rim to finished grade. Yes ☐ No ☐
   (except in floodplain or maintained areas as determined by City of Durham Engineering Division).

7. Are all manhole invert in and out elevations, as well as rim or top elevations, shown on the plans? Yes ☐ No ☐

8. Are all inverts in and out within 0.5 feet maximum difference? Yes ☐ No ☐

9. Are outside drop manholes provided where invert separations exceed 0.5 feet? (minimum vertical separation for 8-inch drop connections is 2.0 feet) Yes ☐ No ☐
   Have the manholes been identified clearly on the dwgs. and details submitted Yes ☐ No ☐

10. Maximum allowable infiltration/exfiltration test rate must not exceed 100 GPD/pipe diameter inch/mile. Does this project meet this requirement? Yes ☐ No ☐

11. Minimum separation distances as shown on the plans or addressed in the specifications.

    a. 100 foot horizontal separation from wells or other water supplies. Yes ☐ No ☐

    b. 12-inch vertical separation from storm sewer Yes ☐ No ☐
    OR ferrous pipe sanitary sewer specified. Yes ☐ No ☐

    c. 10-foot horizontal separation from water mains Yes ☐ No ☐
    OR 18-inch vertical separation Yes ☐ No ☐
    OR ferrous pipe sanitary sewer specified. Yes ☐ No ☐

12. Are manholes subject to flooding? Yes ☐ No ☐

    If yes, are manhole rim elevations 2.0 feet above the 100-year flood level? Yes ☐ No ☐
    OR are the manholes vented and water tight? Yes ☐ No ☐

    If yes, is 100-year flood level shown on plans? Yes ☐ No ☐

13. Does this project have any stream crossings? Yes ☐ No ☐

    If yes, have precautions or special features been utilized to ensure protection of the sewer line and not restrict flow? Identify the sheet of the plans and station number where stream crossings are located:

_____

IV. CERTIFICATIONS:

Applicant's Certification

I, _____ , attest that this application for _____ has been reviewed by me and is accurate and complete to the best of my knowledge. I understand that if all required parts of this application are not completed, and that if all required supporting information and attachments are not included, this application package will be returned as incomplete.

Signature _____ Date _____

Professional Engineer's Certification

I, _____ , attest that this application for _____ has been reviewed by me and is accurate and complete to the best of my knowledge. I further attest that to the best of my knowledge the proposed design has been prepared in accordance with the applicable regulations. Although certain portions of this submittal package have been developed by other professionals, inclusion of these materials under my signature and seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design.

Name of Engineer (please print): _____
North Carolina Professional Engineer's Registration Number: _____

Seal and Signature: _____ Date _____

Seal

PERMIT

This section to be completed by the City of Durham

The plans and specifications cited in the foregoing application are hereby approved pursuant to Article IX of Chapter 23 of the Durham City Code, under the authority granted by the certification of the City of Durham's permitting program by the North Carolina Department of Environmental, Health and Natural Resource.

By _____ Title _____ Date _____

(Revised September 2004)

DURHAM
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CITY OF MEDICINE

City of Durham
Public Works Department
Engineering Division

101 City Hall Plaza, 3rd Floor, Durham, NC 27701
Telephone: (919) 560-4326 Facsimile: (919) 560-4316

WATER EXTENSION PERMIT

Submit this original with 3 Sets of approved plans and submittal fee of $300.00 in check form made payable to City of Durham. Note: If the proposed system contains public and private water mains, separate permit forms, fees, and approved plans must be provided (i.e. one application, $300.00 check, 3 sets of approved plans for public and one application, $300.00 check, 3 sets of approved plans for private).

Date Submitted: _____

Permit Number: _____ *(Assigned by the City)*

1. _____ *(Project Name)*
2. _____ *(Project Tax Map Number)*
3. _____ *(Project Address)*
4. Public _____ Private _____
5. _____ *(Developer's Company Name)*
6. _____ *(Developer's Address)*
7. ( ) _____ *(Developer's Telephone Number)*
8. ( ) _____ *(Developer's FAX Number)*
9. _____ *(Print or Type Name of Developer's Representative)*
10. _____ *(Title)*
11. _____ *(Signature)*
12. _____ *(Date)*

13. The developer listed above is herewith making application to the City of Durham for the approval of said plans and specifications for the installation, construction or alteration of (*give brief description of proposed project*) _____

_____

The undersigned engineer certifies that said plans and specifications have been prepared in compliance with all applicable requirements.

14. _____ *(Engineer's Name)*
15. _____ *(Engineer's Company Name)*
16. _____ *(Engineer's Company Address)*
17. ( ) _____ *(Engineer's Telephone Number)*
18. ( ) _____ *(Engineer's FAX Number)*
19. _____ *(Engineer's Signature)*
20. _____ *(Date)*
21. *(Seal)*

PERMIT

This section to be completed by the City of Durham
The plans and specifications cited in the foregoing application are hereby approved pursuant to Article IX of Chapter 23 of the Durham City Code, under the authority granted by the certification of the City of Durham's permitting program by the North Carolina Department of Environmental, Health and Natural Resources pursuant to the North Carolina Drinking Water Act.

By _____ Title _____ Date _____

(Revised September 2004)

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Engineering Division

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FIRE FLOW TEST APPLICATION

Submit the completed form, along with fee of $850.00, in check form, made payable to the City of Durham

APPLICANT INFORMATION

Date submitted: _____

Applicant:

Name: _____

Company Name: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Telephone Number: ( ) _____ Facsimile Number: ( ) _____

Owner (if not applicant):

Name: _____

Telephone Number: ( ) _____

SITE INFORMATION

Street Address of Project (if applicable): _____

Project Name (e.g., subdivision name): _____

Project Location (including names of adjacent streets and names of, and approximate distances to, cross Streets): _____

_____

VICINITY MAP:

****

For City of Durham Use

Private Test? ☐ *Yes* ☐ *No*

If Yes: ☐ *Witnessed by:* _____

☐ *Additional Comments:* _____

(Over for Testing Process)

(updated July 2004)

City of Durham
FIRE FLOW TEST APPLICATION

Who needs to apply for flow test information?

- Individual property owners with high or low pressure problems.
- Firms that design landscape irrigation systems.
- Engineering firms that design water systems for new development.
- Firms that design fire protection systems for buildings.

When and how should I apply for a flow test?

- Three weeks before you need the results.
- Complete the other side of the sheet and submit it to City Engineering.
- If a new test is required provide the fee for new tests.

How much will it cost me?

- If a new fire flow test is requested a $850.00 charge will be assessed for this service.
- If copies of existing fire flow tests are requested the City of Durham does not charge for this service.

How long does it take to get the results of the flow test?

- If we have date from a recent test that was performed at or in the vicinity of your site, we will provide you with those test results. A test that was conducted within the past **3 years** and within 2000 LF of the project site will be considered a current test.
- If a new test is required, it will be scheduled and conducted in the order it was received by the City. You will receive your test results within **three weeks**.

Can we do the test ourselves?

- Public tests. Public tests are tests which are conducted using hydrants located within the public right-of-way. Public tests must be conducted by City personnel however the City of Durham is currently developing a program whereby private companies will be allowed to become certified to do flow tests in the City of Durham System. Contact Engineering Development Review for more information.
- Private tests. Private tests are conducted using hydrants that are on private property. The property owner or authorized agent is responsible for conducting the test. However, a Fire Flow Application is required so that the City can arrange to witness the test. Any private fire flow tests conducted without being witnessed by the City is in violated of the City Code. It will take up to three weeks for the test to be scheduled for witnessing by the City. After conducting a private test, please forward a copy of the tests results to the address listed on the other side of this sheet.

How will I be notified of these results?

- You will be notified after the tests results are calculated and verified. Typically, results are sent via fax, but they can be sent in the mail if desired.

Do not hesitate to contact us if you have any questions. Please contact the City of Durham Engineering Division (Engineering Technicians) at (919) 560-4326 if you have any questions.

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PROJECT INFORMATION

Submit this form with 5 sets of approved plans

DATE: _____

PROJECT NAME: _____ **PHASE:** _____

PIN: _____ **SITE PLAN CASE #:** _____

LEGAL OWNERS NAME: _____

MAILING ADDRESS: _____

_____ PHONE #: _____ FAX #: _____

ENGINEER/ARCHITECT: _____

MAILING ADDRESS: _____

_____ PHONE #: _____ FAX #: _____

I STREET UTILITIES

	Public				Private			
Street	_____ (LF)				Street	_____ (LF)		
Water Main	Size (in)				Water Main	Size (in)		
	Length (LF)					Length (LF)		
Sewer Main	Size (in)				Sewer Main	Size (in)		
	Length (LF)					Length (LF)		
Sewer Outfall	_____ (LF)				Sewer Outfall	_____ (LF)		
Force Main	_____ (LF)				Force Main	_____ (LF)		

Total Number of Dwelling Units _____ Proposed Flow _____ (gpd)

INSTRUCTIONS

Streets ..... Measured along centerline from face of curb or edge of pavement whichever is applicable. Measure straight through cul-de-sac.
Water Mains ..... Total of all mains 4" and larger.
Sewer Mains ..... Total of all mains, 6" and larger, with manholes (services not included).
Phases ..... Fill out a separate sheet for each phase or section if separate invoices are desired for each phase

II) WATER AND SEWER FRONTAGES

Existing Water & Sewer Extension Agreement? ☐ Yes ☐ No Date of Agreement _____

PROPERTY'S FRONTAGE ON EXISTING ROADS. (List frontage for each road separately).

Street Name	Property's Frontage *

* Measure along existing right-of-way line. Do not include right-of-way for intersecting public streets.

III) IS A STORMWATER MAINTENANCE AGREEMENT REQUIRED FOR THIS PROJECT.

☐ Yes ☐ No

Revised September 2004

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DURHAM
1 8 6 9
CITY OF MEDICINE

City of Durham
Public Works Department
Engineering Division
101 City Hall Plaza, 3rd Floor, Durham, NC 27701
Telephone: (919) 560-4326 Facsimile: (919) 560-4316

RIGHT OF WAY
UTILITY EXCAVATION PERMIT REQUEST

APPLICANT INFORMATION:

Name: _____

Street Address: _____

City: _____ State: _____ Zip: _____

Telephone Number: ( ) _____ Facsimile Number: ( ) _____

Subcontractor: _____ NC Contractor License No.: _____ Phone No.: _____

24 Emergency Phone No.: ( ) _____ Contact Person: _____

Required Plans: ☐ five hard copies attached ☐ one electronic copy (if larger than 8.5x11, one hard copy will be needed)

Location of work

Subdivision: _____

_____ Street, between: _____ and _____

_____ Street, between: _____ and _____

_____ Street, between: _____ and _____

_____ Street, between: _____ and _____

_____ Street, between: _____ and _____

Description of work

Utility type: ☐ Electrical conduit ☐ Telecommunications cable ☐ Gas line
☐ Other _____

Total Length: _____ Number and Size: _____

Type of Excavation: ☐ Bore ☐ Trench ☐ Pavement/Sidewalk Cut – L _____ W _____
☐ Other _____

Dimensions of proposed excavation within City of Durham Right of Way: L _____ W _____ D _____

Proposed Traffic Control: ☐ Detour ☐ Lane Restriction ☐ Other _____

Start Date: _____ Duration of Construction: _____

Reason for Work: _____

Signature _____ **Date** _____

Failure to submit this form and the required plan sheets with complete and accurate information (print or type) will cause delay in the approval process. If deemed necessary, the request will be returned to the applicant for revisions.

(updated October, 2003)

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ENGINEERING DIVISION MOVING INFORMATION FORM

This form is to be used in conjunction with the Building Inspections permits when a structure is moved. Submit to Engineering Division **BEFORE** starting work on the site.

Please provide the following information with this moving form:

1. A copy of the Building Inspections sign off form which shows the original structure address and the proposed address to be moved to.
2. A map and written description of the proposed moving route for the structure.
3. A copy of a plot plan of the proposed lot and the proposed location of the structure and any existing easements or other structures that may cause conflicts.

BY MY SIGNATURE BELOW, I

_____
(Print Contact Name)

_____
(Contact Address, City, State, ZIP)

_____
(Contact Phone number) *(Contact FAX number)*

certify that I have applied for a structure moving permit with Building Inspections. The structure is to be **moved from**

_____
(Previous Structure Address, City, State, ZIP)

The structure will be **moved to:**

_____
(Structure Relocation Address, City, State, ZIP)

Before moving the structure from the existing location, I will do the following:

1. Locate the existing water meter and box. Mark the location to alert the movers and **contact Durham Water and Sewer Maintenance (560-4344)** to remove the existing meter, if needed.
2. Locate the existing sewer cleanout at the right of way. Mark the location to alert the movers. If the cleanout conflicts witht the moving of the structure, dig down around the cleanout a minimum of 24", cap it, and measure its location to two features (ex. property corners) for future reference.
3. **Contact Durham Engineering Inspection (560-4326)** with a 48-hour notice for inspection **before and after** the structure is moved.

I understand that the damage in the right-of-way (including but not limited to water meters, sewer cleanouts, concrete curb and pavement) will be my responsibility to repair or replace as necessary as a result of damage from the moving of the structure. I acknowledge that failure to do these repairs will prevent me from obtaining a Certificate of Occupancy, if applicable. I further acknowledge that I will make any subsequent or prospective buyers aware of this situation.

Signature: _____ Date: _____

(updated October, 2003)

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ENGINEERING DIVISION DEMOLITION INFORMATION FORM

This form is to be used in conjunction with the Building Inspections permits when a structure is moved. Submit to Engineering Division **BEFORE** starting work on the site.

BY MY SIGNATURE BELOW, I

_____
(Print Contact Name)

_____
(Contact Address, City, State, ZIP)

_____
(Contact Phone number) *(Contact FAX number)*

certify that I have applied for a structure moving permit with Building Inspections. The structure is to be **moved from**

_____
(Previous Structure Address, City, State, ZIP)

The structure will be **moved to:**

_____
(Structure Relocation Address, City, State, ZIP)

Before moving the structure from the existing location, I will do the following:

1. Locate the existing water meter and box. Mark the location to alert the movers and **contact Durham Water and Sewer Maintenance (560-4344)** to remove the existing meter, if needed.
2. Locate the existing sewer cleanout at the right of way. Mark the location to alert the movers. If the cleanout conflicts witht the moving of the structure, dig down around the cleanout a minimum of 24", cap it, and measure its location to two features (ex. property corners) for future reference.
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I understand that the damage in the right-of-way (including but not limited to water meters, sewer cleanouts, concrete curb and pavement) will be my responsibility to repair or replace as necessary as a result of damage from the moving of the structure. I acknowledge that failure to do these repairs will prevent me from obtaining a Certificate of Occupancy, if applicable. I further acknowledge that I will make any subsequent or prospective buyers aware of this situation.

Signature: _____ Date: _____

(updated October, 2003)

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SECTION 14

ENGINEERING DEVELOPMENT FEES

This section is intended to aid in the process of determining Engineering fees that may be associated with the project. Contact other departments and agencies (i.e. Planning, Building Inspections, Durham County Erosion Control, Durham County Sewer etc.) to get a listing of these fees.

I. Water and Sanitary Sewer Charges:

A. Frontage Charges:

These fees are applicable when property is developed and a water and/or sanitary sewer line has not been installed by the developer or property owner across the street frontage or street right-of-way abutting the project. These fees are paid when the mains are extended for new projects. If no extension is made frontage charges are paid with the application for service.

The current frontage charges are:	Water	Sewer Sanitary
Inside City Limits and Priority Growth Area	$14.50/LF	$23.50/LF
Outside the Priority Growth Area	$16.00/LF	$26.50/LF

B. Capital Facilities Fees:

-are due prior to connection. Typically, these fees are paid with the application for the service connection. The fees below are required per Section 23-40.1 of the Ordinance and shall be in full force and effect of September 1, 2002.

The current capital facilities fees are:

Meter Size	Water	Sanitary Sewer	Total
5/8"	$1,161	$915	$2,076
1"	$2,603	$2,286	$4,889
1-1/2"	$5,006	$4,573	$9,579
2"	$7,889	$7,316	$15,205
3"	$17,020	$16,004	$33,024
4"	$48,258	$45,726	$93,984
6"	$96,315	$91,452	$187,767
8"	$168,402	$160,041	$328,443
10"	$264,517	$251,493	$516,010
Over l0" (per gpd)	$3.45	$3.05	$6.50

Note: Fees are subject to change without notification

C. Meter and Service Charges*:

These fees are applicable for existing services that need a meter set with new development with the developer installing the mains and services.

1. Water Meter Actual Costs (existing service and meter box or vault)

Meter Size	Pick-Up	Installed by City
5/8" meter	N/A	$80.00
1" meter	N/A	$125.00
1-1/2" meter	$154.00	$215.00
2" meter	$325.00	$465.00
3" meter	$588.00	$838.00
4" meter	$982.00	$1,232.00
6" meter	$l,797.00	$2,l97.00
8" meter	$2,615.00	$3,015.00
10" meter	$4,284.00	$4,734.00
12" meter	$5,838.00	$6,288.00

D.

2. Lead Test Fee (for occupancy of a new structure; paid for when buying meter).

**Note: For infill lots and single lot Developments call Engineering Services for information on City installed Water and Sanitary Sewer Services.*

II. Other Charges

A. **Construction Drawing Review Fee (Paid at time of initial submittal)**

i.	For Plans containing Plan and Profile sheets……..	$450.00
ii.	For all other Plans……...	$200.00
iii.	For Plans submitted during actual Construction related to field modifications. ……..	$200.00

B. **Extension Agreement License Agreement (Paid at time of application submittal)**..... $200.00
C. **Fire Flow Test Request (Paid prior to actual test)**…….. $850.00
D. **Water Extension Permit* (Paid at time of permit application submittal)**..... $300.00
E. **Sewer Extension Permit* (Paid at time of permit application submittal)**..... $450.00
F. **Construction Inspection Fees: (Public and Private)**

Street	$2.00/LF
Water Main	$1.00/LF
Sanitary Sewer Main	$1.00/LF
Sanitary Sewer Outfall	$1.00/LF

G. **Driveway, Right-of-Way Excavation:**
Storm Drainage and other Miscellaneous Permit……. $40.00

*After August 1, 2004

H. **Storm Water Items:**

Storm Water Facility Permit…….	$2000.00/facility
Surety Bond (based upon size of basin and due before construction plans are signed)……	$(To be determined)

I. **Impact Fees**

Determined at the time of application for building permit by the Inspections Department.

***Note: Fees are subject to change*